Geostationary Operational Environmental Satellite (GOES)

GOES-R Series

General Interface Requirements Document (GIRD)

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February 22, 2007

Geostationary Operational Environmental Satellite (GOES)

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General Interface Requirements Document (GIRD)

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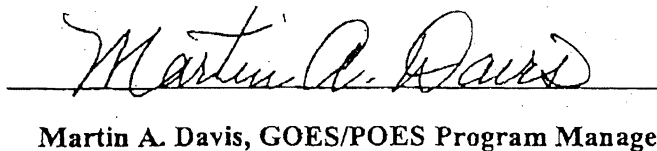
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/Systems Engineering

GIRD

417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)

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Contents

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GIRD1	1	**1 SCOPE**
GIRD2	1.1	**1.1 Introduction**
GIRD3	1.1.0-1	This General Interface Requirements Document (GIRD) sets forth the general, mechanical, thermal, electrical power, command and data handling and contamination control interface requirements imposed on both the instruments and spacecraft for the Geosynchronous Operational Environmental Satellite (GOES) -R Series System. It also defines the general environments to which the satellite will be subjected. The spacecraft contractor and the instrument contractor shall each meet their respective interface requirements defined in this document.

The Unique Instrument Interface Document (UIID) for an instrument defines the specific resource allocations, documents exceptions to the GIRD requirements and constraints, and defines the special requirements not specifically covered in the GIRD. The instrument contractor will create and maintain, with government approval, an Instrument Descriptive Document (IDD) which describe the detail instrument design and unique interface requirements. The GIRD, in conjunction with the UIID and the IDD establishes the instrument-to-spacecraft interface requirements.

Interface Control Documents (ICDs) will define the specific details of the complete spacecraft to instrument interface information (i.e., mechanical, electrical power, command and data handling, and thermal interfaces). These will be developed by the spacecraft contractor to document the Instrument-Spacecraft interface. The spacecraft contractor will control the ICDs and the ICDs will replace the related IDDs.

ID	Object Number	
GIRD4	1.2	**1.2 Requirements Terminology** *(CCR 00098)*
GIRD1154	1.2.0-1	The following requirements terminology is used throughout this document: *(CCR 00098)*
GIRD1146	1.2.0-2	The term *"shall"* designates a requirement that must me achieved and is synonymous with the term *"threshold."*

The term *"should"* designates a desired level of performance the government would like the contractor to strive towards achieving and is synonymous with the term *"goal."*

All other terms, including *"will"*, only designate statements of fact or intentions of the government and are not to be interpreted as contractor requirements. *(CCR 00098)*

ID	Object Number	
GIRD1147	1.2.0-3	The term "TBD" means, "to be determined." This is applied to requirements or values that have not been defined. The contractor **shall** propose a requirement or value and provide a rationale for all TBD requirements. *(CCR 00098)*
GIRD1148	1.2.0-4	TBD requirement proposals **shall** be made in coordination with the government and may involve other contractors. *(CCR 00098)*
GIRD1149	1.2.0-5	The contractor **shall** request approval from the government before proceeding with its proposed TBD requirement or value. *(CCR 00098)*
GIRD1150	1.2.0-6	The term "TBR" means, "to be reviewed." This is applied to requirements or values that are subject to review by the government and the contractor. The contractor **shall** review and suggest a modified value and rationale for all TBR requirements. The "TBR" provides an indication that the value may change upon review. *(CCR 00098)*
GIRD1151	1.2.0-7	TBR requirement proposals **shall** be made in coordination with the government and may involve other contractors. *(CCR 00098)*

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GIRD1152	1.2.0-8	The contractor **shall** request approval from the government before proceeding with its proposed TBR requirement or value. *(CCR 00098)*
GIRD1153	1.2.0-9	The term "TBS" means, "to be supplied." The government will supply TBS requirements. The government will provide a date or milestone at which each TBS requirement will be supplied. *(CCR 00098)*
GIRD5	1.2.0-10	An instrument may comprise more than one physical assembly, or unit. "Sensor unit" refers to the unit that contains the optics. "Instrument unit" means the sensor unit, electronics box (if applicable), or other units of the instrument. *(CCR 00098)*
GIRD6	1.3	**1.3 Order of Precedence**
GIRD7	1.3.0-1	The order of precedence of interface requirements documents is the UIID at the highest level, followed in order by the GIRD, ICD, and IDD.

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GIRD10	2	# 2 Documents
GIRD1060	2.1	## 2.1 Applicable Documents
GIRD11	2.1.0-1	

The following documents of the exact issue shown form a part of this GIRD to the extent specified herein. In the event of conflict between the documents referenced and the contents of this GIRD the latter **shall** be the superseding requirement.

MIL-STD-461E Aug 99 - Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

ECSS-E-50-12A - Space Wire - Links, Nodes, Routers and Networks, 24 January 2003 European Cooperation for Space Standardization (ECSS)

ISO/DIS 14644-1 - Cleanrooms and Associated Controlled Environments, May 1, 1999 *(CCR 00158)*

CCSDS 133.0-B-1 Space Packet Protocol, Blue Book, Issue 1, September 2003 *(CCR 00158)*

IEEE/ASTM SI-10 - American National Standard for Use of the International System of Units (SI): The Modern Metric System, December 2002 *(CCR 00158)*

417-R-RPT-0027 - The Radiation Evironment for Electronic Devices on GOES-R Series Satellites, August 14, 2006 *(CCR 00274)*

CCSDS 301.0-B-3 - Time Code Formats. Blue Book. Issue 3, January 2002

NASA/TM-2001-211221 - Guideline for the Selection of Near-Earth Thermal Environment Parameters for Spacecraft Design, October 2001

417-R-RPT-0050 - GOES-R Reliable Data Delivery Protocol Version 2.0 January 30, 2007 *(CCR 00109) (CCR 00213) (CCR 00274) (CCR 00372)*

ISO/DIS 14644-3 Cleanrooms and associated controlled environments - Part 3: Metrology and test methods, 9/26/02 *(CCR 00115)*

SN-C-0005 Revision D, Contamination Control Requirements, July 20,1998 *(CCR 00115)*

| GIRD1061 | 2.2 | ## 2.2 Reference Documents |
| GIRD1062 | 2.2.0-1 | |

Spacecraft Attitude Determination and Control, edited by James R. Wertz (Boston: Reidel, 1978), pp. 268-270.

Farrenkopf, R. L., "Analytic Steady-State Accuracy Solutions for Two Common Spacecraft Attitude Estimators," Journal of Guidance and Control (Reston, VA: American Institute of Aeronautics and Astronautics), July-August, 1978, Vol. 1, No. 4, pp. 282-284.

Markley, F. Landis, and R. G. Reynolds, "Analytic Steady-State Accuracy of a Spacecraft Attitude Estimator," Journal of Guidance, Control, and Dynamics (Reston, VA: American Institute of Aeronautics and Astronautics), November-December, 2000, Vol. 23, No.6, pp. 1065-1067.

CCSDS 701.0-B-3 - Recommendations for Advanced Orbiting Systems, Networks and Data Links, Architectural Specification, June 1, 2001 *(CCR 00158)*

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD12	3	## 3 Requirements
GIRD13	3.1	## 3.1 General Requirements
GIRD14	3.1.1	### 3.1.1 Instrument Modes
GIRD18	3.1.1.1	### 3.1.1.1 Mode Changes External Harm
GIRD19	3.1.1.1.0-1	The instrument **shall** transition from its current mode to any other mode without harming any other instrument or spacecraft bus component.
GIRD20	3.1.1.2	### 3.1.1.2 Power Off Mode
GIRD21	3.1.1.2.0-1	The Instrument Power OFF Mode **shall** not draw operational power.
GIRD26	3.1.1.3	### 3.1.1.3 Instrument Safe Mode
GIRD28	3.1.1.3.1	### 3.1.1.3.1 Instrument Safe Mode Command
GIRD29	3.1.1.3.1.0-1	The instrument **shall** enter Instrument Safe Mode upon receipt of a safeing command from the spacecraft.
GIRD30	3.1.1.3.2	### 3.1.1.3.2 Instrument Safe Mode Timeout
GIRD31	3.1.1.3.2.0-1	The instrument **shall** enter Instrument Safe Mode upon the detection of 10 consecutive missing time messages.
GIRD34	3.1.1.4	### 3.1.1.4 Survival and Storage Modes
GIRD35	3.1.1.4.0-1	The spacecraft **shall** provide survival heater power in Survival and Storage modes.
GIRD1134	3.1.1.4.0-2	The instrument **shall** not draw operational power while in Survival and Storage modes.
GIRD38	3.1.2	## 3.1.2 Operational Concepts
GIRD39	3.1.2.1	### 3.1.2.1 Pre-Launch
GIRD40	3.1.2.1.0-1	The satellite will be transported to the launch site where final vehicle preparations and checkout will be accomplished.
GIRD838	3.1.2.1.0-2	Final inter-segment and system verification tests will be accomplished prior to launch.
GIRD839	3.1.2.1.0-3	Instrument testing and inspection to be accomplished at the launch site will be documented in the ICD.
GIRD41	3.1.2.2	### 3.1.2.2 Launch and Orbit Raising
GIRD42	3.1.2.2.0-1	During launch the various spacecraft subsystems may be powered on or turned off in order to provide protection from the launch and injection environments or to comply with other specified requirements. Spacecraft telemetry to monitor vehicle status may be provided during launch. Transmission of launch vehicle telemetry may satisfy this requirement during the launch phase. During the Orbit Raising and after insertion into its operational orbit, appropriate deployments would be initiated by command. Spacecraft telemetry transmission to ground monitoring stations would be used to the extent practicable.
GIRD1076	3.1.2.2.0-2	The instrument will be in Survival Mode during launch.

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GIRD840	3.1.2.2.0-3	The instrument contractor will identify in the IDD the required configuration of the instrument for the launch environment, and the power required, in the event the mode is to be anything other than OFF, and also to document required sequences leading up to the pre-launch OFF mode.
GIRD43	3.1.2.3	**3.1.2.3 On-Orbit Concept**
GIRD44	3.1.2.3.0-1	The satellite will operate in a geosynchronous orbit (Semi-major axis of approximately 42,164 Km) located at either 75° or 135° west longitude. Normal on-orbit operations entail periodic station keeping maneuvers that keep the satellite within a 0.5° inclination about the equator and within ±0.5° of the on-station longitude.
GIRD841	3.1.2.3.0-2	The spacecraft will be 3-axis stabilized.
GIRD842	3.1.2.3.0-3	Instruments **shall** survive an anomaly resulting in a static instrument line-of-sight (LOS) such that the sun passes through the LOS at orbit rate.
GIRD45	3.1.2.3.0-4	Instruments **shall** survive a spacecraft attitude anomaly resulting in the sun being at an arbitrary fixed location within the instrument field of regard (FOR).
GIRD46	3.1.2.3.0-5	Instruments **shall** survive a spacecraft attitude anomaly resulting in the sun sweeping through the field-of-view (FOV) of the instrument radiator from "horizon to horizon" at a rate of 6°/minute, passing through radiator normal.
GIRD47	3.1.3	**3.1.3 Dimension Standard**
GIRD48	3.1.3.0-1	For all documents related to instrument interfaces, the spacecraft and instrument contractors **shall** use the International System of Units (SI) for all measurement units in accordance with IEEE/ASTM SI-10. The contractor may include English units in parenthesis for clarification.
GIRD51	3.1.4	**3.1.4 Coordinates**
GIRD52	3.1.4.0-1	The orbit reference frame (ORF) **shall** be defined as follows: *(CCR 00005)* The ORF is orthogonal and right-handed. The ORF origin is at the spacecraft center of mass. The ORF +z axis points toward the center of the Earth. The ORF +y axis points along the negative orbit normal. The ORF +x axis completes the triad.
GIRD53	3.1.4.0-2	The body reference frame (BRF) **shall** be defined as follows: *(CCR 00005)* The BRF is orthogonal and right-handed. The BRF is fixed to the body of the spacecraft. The location of the BRF origin will be specified by the spacecraft contractor. The BRF axes are nominally parallel to the ORF axes when spacecraft attitude is in its nominal Earth-pointing, upright yaw attitude with zero attitude error. The roll, pitch, and yaw axes are defined to be parallel to the BRF x, y, and z axes, respectively.
GIRD54	3.1.4.0-3	If there is a yaw-flip, the spacecraft will be flown upright (+Y BRF pointed in the +Y ORF direction) during northern hemisphere winter and inverted (+Y BRF pointed in the -Y ORF direction) during northern hemisphere summer. i.e., the +Y BRF axis is generally in the same hemisphere as the Sun.
GIRD55	3.1.4.0-4	If there is no yaw-flip, the spacecraft will be flown upright all year.

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GIRD1063	3.1.4.0-5	At the option of the government, the spacecraft may be flown such that the BRF is offset from the ORF so that the BRF x-axis is always parallel to the Earth's equator and/or the BRF z-axis always points to the nominal subsatellite point.
GIRD870	3.1.4.0-6	The reference coordinate system of each instrument unit **shall** be nominally parallel to the spacecraft BRF coordinate system, with the exception of solar-pointing instruments.
GIRD871	3.1.4.0-7	The origin of the coordinate system of each instrument unit **shall** be located and defined inside the mechanical envelope of the instrument unit.
GIRD1135	3.1.5	### 3.1.5 Yaw Flip
GIRD1136	3.1.5.0-1	For an instrument with passive cryogenic detector cooling, the GOES spacecraft will be rotated 180° about the Z-axis (yaw) twice per year to keep the -Y axis side of the spacecraft shaded, within ±4 days of the Sun crossing the orbit plane.
GIRD1137	3.1.5.0-2	The rotation will be performed any time during the 8-day window and will be carried out such that neither the Sun nor Earth illuminates the cooler during the maneuver. The maneuver is expected to last less than 1 hour. The net effect reverses the sign of the roll and pitch axes while maintaining yaw pointing at nadir.
GIRD56	3.2	### 3.2 Interface Requirements
GIRD931	3.2.0-1	All instrument-to-spacecraft interfaces **shall** be single fault tolerant.
GIRD57	3.2.1	### 3.2.1 Mechanical
GIRD58	3.2.1.1	### 3.2.1.1 Instrument Envelopes
GIRD59	3.2.1.1.0-1	The instrument units **shall** meet the dimensional envelope constraints defined in the UIID under conditions encountered during launch, deployment, and on-orbit operations.
GIRD60	3.2.1.1.1	### 3.2.1.1.1 Envelope Documentation
GIRD61	3.2.1.1.1.0-1	The instrument contractor will document the instrument unit envelopes in the IDD by engineering drawings with a set of "not to exceed" dimensions. The instrument envelopes will be inclusive of the thermal blankets.
GIRD62	3.2.1.1.1.0-2	The instrument contractor will ensure that the swept or deployed volume includes tolerances, distortions and misalignments.
GIRD63	3.2.1.1.2	### 3.2.1.1.2 Critical Clearances
GIRD65	3.2.1.1.2.0-1	The satellite **shall** fit within the dynamic envelope of the launch vehicle fairing as described in the satellite-to-launch vehicle ICD.
GIRD66	3.2.1.1.2.0-2	The spacecraft contractor will position the instrument units on the spacecraft to ensure that the stowed, deploying, and final deployed positions of the instrument units clear all obstacles including obstacles on the spacecraft, other instruments, and the launch vehicle.
GIRD67	3.2.1.1.2.0-3	A minimum of 2.5 cm clearance **shall** be maintained between the instrument units and surrounding structure.
GIRD69	3.2.1.1.2.0-4	The spacecraft contractor will implement a critical clearance analysis to ensure that the clearance rule is not violated.
GIRD70	3.2.1.1.2.0-5	The instrument thermal blankets **shall** not impede any deployment or mechanism motion.
GIRD72	3.2.1.2	### 3.2.1.2 Fields of View

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD73	3.2.1.2.0-1	The spacecraft **shall** provide the instrument fields-of-view defined in the UIID.
GIRD74	3.2.1.2.0-2	The instrument contractor will document the instrument field-of-view requirements in the IDD.
GIRD77	3.2.1.2.0-3	Instruments **shall** meet all performance requirements whether or not the spacecraft performs a yaw flip, except for instruments with cryogenic detectors cooled by a passive radiator.
GIRD78	3.2.1.3	**3.2.1.3 Mass Properties**
GIRD79	3.2.1.3.0-1	The instrument mass **shall** be less than or equal to that allocated in the UIID.
GIRD80	3.2.1.3.0-2	The mass of the instrument units will be measured with an accuracy of ± 0.5 kg.
GIRD81	3.2.1.3.0-3	The instrument mass **shall** be constant unless mass expulsion rates and substances are allocated by the UIID.
GIRD83	3.2.1.3.0-4	The nominal launch mass with tolerances of each instrument unit will be provided to the spacecraft contractor for documentation in the ICD.
GIRD84	3.2.1.3.1	**3.2.1.3.1 Center of Mass**
GIRD87	3.2.1.3.1.0-1	The instrument contractor will determine the centers of mass for each flight instrument unit relative to the instrument unit coordinate system with an accuracy of ± 5 mm including launch and deployed configurations.
GIRD88	3.2.1.3.1.0-2	The launch and deployed centers of mass with tolerances of each instrument unit will be provided to the spacecraft contractor for documentation in the ICD, referenced to the instrument coordinate axes.
GIRD90	3.2.1.3.2	**3.2.1.3.2 Inertia Properties**
GIRD91	3.2.1.3.2.0-1	The instrument unit moment of inertia will be defined using the instrument unit coordinate frame passing through the instrument center of mass.
GIRD92	3.2.1.3.2.0-2	The instrument contractor will determine the moments and products of inertia values with an accuracy of $\pm 5\%$ of the maximum principal moment of inertia.
GIRD93	3.2.1.3.2.0-3	The launch and deployed moments and products of inertia with tolerances of each separately-mounted instrument unit, referenced to the instrument coordinate axes, will be provided to the spacecraft contractor for documentation in the ICD.
GIRD96	3.2.1.4	**3.2.1.4 Mounting**
GIRD97	3.2.1.4.1	**3.2.1.4.1 Hardware**
GIRD98	3.2.1.4.1.0-1	The spacecraft contractor will define and document all mounting hardware in the ICD and indicate the hardware provider.
GIRD99	3.2.1.4.1.0-2	Unless otherwise specified, the spacecraft contractor will provide all mounting hardware for the instrument units.
GIRD100	3.2.1.4.1.0-3	The instrument sensor unit **shall** mount to the spacecraft as described in the instrument UIID.
GIRD101	3.2.1.4.1.0-4	The instrument contractor will provide all kinematic mounts, plus vibration isolation and thermal isolation mounting hardware.
GIRD102	3.2.1.4.1.0-5	The instrument units will be delivered to the spacecraft contractor with flight mounts installed.
GIRD103	3.2.1.4.2	**3.2.1.4.2 Method**

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD104	3.2.1.4.2.0-1	The spacecraft and instruments **shall** be designed using a mounting method that accommodates manufacturing tolerances, structural distortion, thermal distortions and alignment requirements. *(CCR 00096A)*
GIRD1155	3.2.1.4.2.0-2	Partitioning of the mounting method tolerances, distortions, and alignment requirements between the spacecraft and the instruments **shall** be defined in the ICD. *(CCR 00096A)*
GIRD105	3.2.1.4.2.0-3	The instrument units, excluding the sensor unit **shall** be capable of being mounted to the spacecraft with the spacecraft mounting surface in the vertical or in the horizontal position with the spacecraft mounting surface normal pointing up.
GIRD1070	3.2.1.4.2.0-4	The instrument sensor unit **shall** be capable of being mounted to the spacecraft with the spacecraft mounting surface in the horizontal position with the spacecraft mounting surface normal pointing up.
GIRD106	3.2.1.4.2.0-5	For instrument units with a mass greater than 15 kg, a minimum of three lifting points **shall** be provided.
GIRD107	3.2.1.4.2.0-6	The design of the lifting points **shall** allow handling with an overhead crane including when the unit is in its flight configuration.
GIRD1056	3.2.1.4.2.0-7	Each instrument unit design **shall** allow integration and de-integration to the spacecraft while using access constrained to the inside of the instrument dimensional envelope defined in the UIID with access penetrations into this envelope through the face of the envelope that is opposite to the mechanical interface plane.
GIRD109	3.2.1.4.2.0-8	Each instrument unit mounting method **shall** not require access from inside the spacecraft.
GIRD110	3.2.1.4.2.0-9	The method by which each instrument unit is mounted to the spacecraft will be defined in the ICD.
GIRD111	3.2.1.4.3	**3.2.1.4.3 Handling Fixtures**
GIRD112	3.2.1.4.3.0-1	The instrument contractor will provide proof tested handling fixtures for each unit with a mass greater than 15 kg.
GIRD113	3.2.1.4.3.0-2	Handling fixtures **shall** be designed to 5 times limit load for ultimate and 3 times limit load for yield.
GIRD114	3.2.1.4.3.0-3	Handling fixtures will be tested to 2 times working load.
GIRD115	3.2.1.4.4	**3.2.1.4.4 Interface**
GIRD116	3.2.1.4.4.0-1	The spacecraft mounting surface **shall** be flat to less than 0.83 mm per meter peak to peak.
GIRD117	3.2.1.4.4.0-2	The spacecraft contractor working with the instrument contractor will define the mechanical mounting interface requirements for each instrument unit in the ICD. Requirements include surface flatness, finish, mounting bolt size, number, material, and torque limits.
GIRD118	3.2.1.4.5	**3.2.1.4.5 Location**
GIRD119	3.2.1.4.5.0-1	The spacecraft contractor working with the instrument contractor will define and document the location and orientation of instrument units on the spacecraft in the ICD.
GIRD120	3.2.1.4.5.0-2	Coordinates and dimensions of the holes for mounting hardware will be specified at the mechanical interface and defined in the ICD.
GIRD121	3.2.1.4.6	**3.2.1.4.6 Drill Templates**

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GIRD122	3.2.1.4.6.0-1	The pattern of mounting holes in a unit **shall** allow like units to be interchanged.
GIRD123	3.2.1.4.6.0-2	Instrument unit, spacecraft, and test fixture interfaces **shall** be drilled using templates to correctly establish the pattern of the mounting holes.
GIRD124	3.2.1.4.6.0-3	The drill template **shall** include appropriate alignment, orientation and location reference information and alignment cubes if required.
GIRD125	3.2.1.4.6.0-4	The spacecraft contractor will document fabrication, functional requirements, and orientation information for the drill templates in the ICD.
GIRD126	3.2.1.4.6.0-5	The instrument contractor will provide an alignment drill template labeled with appropriate alignment, orientation, location reference information, and alignment cubes if necessary.
GIRD127	3.2.1.5	**3.2.1.5 Alignment**
GIRD135	3.2.1.5.0-1	The instrument contractor will measure the alignment between the sensor line-of-sight and the instrument alignment reference frame and deliver the results to the spacecraft contractor.
GIRD1065	3.2.1.5.0-2	The spacecraft contractor is responsible for the alignment knowledge of the input axes of the spacecraft IRU with respect to the IRU reference frame.
GIRD138	3.2.1.5.0-3	The spacecraft contractor will document all alignment measurements in an alignment report.
GIRD1066	3.2.1.5.0-4	The spacecraft and instrument contractors will negotiate and document in the ICD any relevant alignment requirements not specified in this document (GIRD).
GIRD128	3.2.1.5.1	**3.2.1.5.1 Nadir Pointed Instrument Alignment *(CCR 00332)***
GIRD1083	3.2.1.5.1.1	**3.2.1.5.1.1 References**
GIRD129	3.2.1.5.1.1.0-1	The instrument **shall** include a permanent alignment reference on the instrument sensor unit composed of a minimum 2.54 cm alignment cube and a mounting surface datum. The instrument alignment cube defines the instrument alignment reference frame.
GIRD131	3.2.1.5.1.1.0-2	The spacecraft inertial reference unit (IRU) **shall** include an alignment cube mounted on the IRU. This alignment cube defines the IRU reference frame. The IRU reference frame is the navigation reference frame of the spacecraft and is nominally parallel to the BRF.
GIRD132	3.2.1.5.1.1.0-3	The spacecraft IRU and instrument alignment cube pairs **shall** be viewable from two orthogonal directions.
GIRD133	3.2.1.5.1.1.0-4	The instrument contractor will document the location of all instrument optical alignment cubes in the IDD.
GIRD1064	3.2.1.5.1.1.0-5	The instrument mounting frame is an orthogonal reference frame defined by the locations of the spacecraft side of the instrument mounting points. A rigorous definition of this frame will be documented in the ICD. The instrument mounting frame is nominally parallel to the BRF.
GIRD1084	3.2.1.5.1.2	**3.2.1.5.1.2 Responsibilities**
GIRD136	3.2.1.5.1.2.0-1	The spacecraft contractor will align the instrument alignment reference frame to the spacecraft IRU reference frame.
GIRD137	3.2.1.5.1.2.0-2	The spacecraft contractor will measure the alignment between the instrument alignment reference frame and the spacecraft IRU reference frame.
GIRD1085	3.2.1.5.1.3	**3.2.1.5.1.3 Placement**

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GIRD140	3.2.1.5.1.3.0-1	The placement of the instrument alignment reference frame with respect to the spacecraft IRU reference frame **shall** be to within 0.25 degrees per axis (TBR), including variation over all launch and on-orbit environments
GIRD1086	3.2.1.5.1.4	**3.2.1.5.1.4 Initial Alignment Knowledge**
GIRD142	3.2.1.5.1.4.0-1	The prelaunch alignment knowledge of the instrument alignment reference frame with respect to the spacecraft IRU input axes **shall** be 50 (TBR) microradians or better per axis.
GIRD1087	3.2.1.5.1.5	**3.2.1.5.1.5 On-Orbit Alignment Knowledge**
GIRD1088	3.2.1.5.1.5.0-1	The on-orbit alignment knowledge of the instrument mounting frame with respect to the spacecraft IRU input axes **shall** be 50 (TBR) microradians or better, per axis. This requirement includes launch shift, on-orbit calibration uncertainty, on-orbit environments, and spacecraft structural and thermal stability.
GIRD1089	3.2.1.5.1.5.0-2	Contractor-specified operations for on-orbit calibration **shall** be consistent with the GOES-R operational concept, particularly as related to operational outages, as documented in **TBS**.
GIRD1090	3.2.1.5.1.6	**3.2.1.5.1.6 Alignment Rate of Change**
GIRD144	3.2.1.5.1.6.0-1	The rate of change of the alignment of the instrument mounting frame with respect to the spacecraft IRU input axes **shall** not exceed 100 (TBR) microradians per hour per axis. This requirement includes on-orbit environments and spacecraft structural and thermal stability.
GIRD1091	3.2.1.5.2	**3.2.1.5.2 Reserved (CCR 00095)**
GIRD1092	3.2.1.5.2.1	**3.2.1.5.2.1 Reserved (CCR 00095)**
GIRD1093	3.2.1.5.2.1.0-1	Reserved *(CCR 00077) (CCR 00095)*
GIRD1094	3.2.1.5.2.1.0-2	Reserved *(CCR 00077) (CCR 00095)*
GIRD1095	3.2.1.5.2.1.0-3	Reserved *(CCR 00077) (CCR 00095)*
GIRD1096	3.2.1.5.2.1.0-4	Reserved *(CCR 00095)*
GIRD1097	3.2.1.5.2.1.0-5	Reserved *(CCR 00077) (CCR 00095)*
GIRD1098	3.2.1.5.2.2	**3.2.1.5.2.2 Reserved (CCR 00095)**
GIRD1099	3.2.1.5.2.2.0-1	Reserved *(CCR 00077) (CCR 00095)*
GIRD1100	3.2.1.5.2.2.0-2	Reserved *(CCR 00077) (CCR 00095)*
GIRD1101	3.2.1.5.2.2.0-3	Reserved *(CCR 00077) (CCR 00095)*
GIRD1102	3.2.1.5.2.2.0-4	Reserved *(CCR 00077) (CCR 00095)*
GIRD1103	3.2.1.5.2.3	**3.2.1.5.2.3 Reserved (CCR 00095)**
GIRD1104	3.2.1.5.2.3.0-1	Reserved *(CCR 00077) (CCR 00095)*
GIRD1105	3.2.1.5.2.4	**3.2.1.5.2.4 Reserved (CCR 00095)**
GIRD1106	3.2.1.5.2.4.0-1	Reserved *(CCR 00095)*
GIRD1107	3.2.1.5.2.5	**3.2.1.5.2.5 Reserved (CCR 00095)**

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GIRD1108	3.2.1.5.2.5.0-1	Reserved *(CCR 00095)*
GIRD145	3.2.1.6	**3.2.1.6 Access**
GIRD146	3.2.1.6.0-1	The position of the instrument units on the spacecraft **shall** leave adequate clearance between the instrument and surrounding structures to provide access to instrument mounting hardware, access to instrument connectors, and space for instrument interfacing harness service loops.
GIRD147	3.2.1.6.0-2	Instrument access requirements will be documented in the ICD.
GIRD148	3.2.1.6.0-3	All instrument units to be installed, removed or replaced at the satellite level **shall** be accessible without disassembly of the unit.
GIRD149	3.2.1.7	**3.2.1.7 Attitude and Disturbances for Nadir Pointed Instruments *(CCR 00332)***
GIRD150	3.2.1.7.0-1	The requirements in this section apply to nadir-pointing instruments while the instrument is on orbit and operating and also to body-mounted space environment instruments.
GIRD151	3.2.1.7.1	**3.2.1.7.1 Spacecraft Attitude and Disturbances**
GIRD1109	3.2.1.7.1.0-1	The interface attitude error and disturbance limits include government-held reserve and all spacecraft errors, including orbit and attitude knowledge, attitude command error, and attitude control error with all instruments operating in normal operational mode.
GIRD152	3.2.1.7.1.1	**3.2.1.7.1.1 Attitude Error**
GIRD153	3.2.1.7.1.1.0-1	The attitude error of the instrument mounting frame relative to the desired ORF-referenced attitude **shall** not exceed ± 360 **(TBR)** microradians, 3-sigma, per axis. Attitude error is defined as the difference between the desired attitude and the actual, or true, attitude of the instrument mounting frame.
GIRD1067	3.2.1.7.1.1.0-2	The instrument mounting frame attitude **shall** be stable to within 500 microradians, peak-to-peak, 3-sigma, per axis, over any 60-second period of time.
GIRD154	3.2.1.7.1.2	**3.2.1.7.1.2 Attitude Error Rate**
GIRD155	3.2.1.7.1.2.0-1	For a given total spacecraft gyro signal phase delay, the instrument mounting frame attitude error rate relative to the desired ORF-referenced attitude **shall** not exceed ± the corresponding limit from the Total Spacecraft Gyro Signal Phase Delay and Rate Error Trade Space Figure provided below, per axis, when the rate is filtered by a fourth order Butterworth low pass filter with a -3dB frequency of 15 Hz.

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GIRD155   3.2.1.7.1.2.0-1
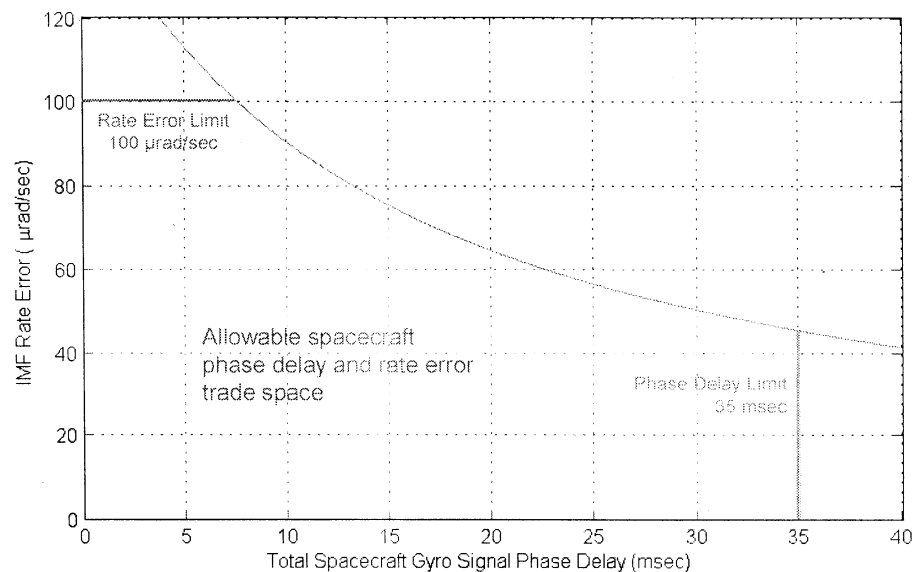
Total Spacecraft Gyro Signal Phase Delay and Rate Error Trade Space Figure

GIRD156   3.2.1.7.1.3   **3.2.1.7.1.3 Spacecraft Translation Acceleration Limits**

GIRD157   3.2.1.7.1.3.0-1   The translational accelerations at the spacecraft side of each instrument sensor unit mount **shall** not exceed the limits specified in the Translational Acceleration Limits for Spacecraft to Instrument Table below. The limits apply to each orthogonal axis after the acceleration is bandpass-filtered using at least a fourth-order band-pass Butterworth filter with -3dB frequencies of f_1 and f_2. Note that the filter has fourth-order rolloff on both sides of the response. The accelerations can be present at any combination of the instrument sensor unit mounts and along any combination of the three orthogonal axes at each mount. *(CCR 00163)*

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GIRD157   3.2.1.7.1.3.0-1   **Translational Acceleration Limits for Spacecraft to Instrument Table**

f_1 (Hz)	f_2 (Hz)	Peak Limit (mg)	f_1 (Hz)	f_2 (Hz)	Peak Limit (mg)	f_1 (Hz)	f_2 (Hz)	Peak Limit (mg)
0.0	512.0	18.44	26.9	30.2	0.40	114.0	128.0	2.40
0.9	10.1	1.50	28.5	32.0	0.40	120.8	135.6	2.40
6.3	32.0	1.00	30.2	33.9	1.40	128.0	143.7	2.40
20.2	101.6	4.29	32.0	35.9	1.40	135.6	152.2	1.40
64.0	322.5	10.55	33.9	38.1	1.40	143.7	161.3	1.40
203.2	512.0	15.16	35.9	40.3	1.40	152.2	170.9	1.40
9.0	10.1	0.40	38.1	42.7	1.40	161.3	181.0	3.02
9.5	10.7	0.40	40.3	45.3	1.40	170.9	191.8	3.02
10.1	11.3	0.40	42.7	47.9	1.40	181.0	203.2	3.02
10.7	12.0	0.40	45.3	50.8	1.40	191.8	215.3	3.02
11.3	12.7	0.40	47.9	53.8	1.40	203.2	228.1	2.56
12.0	13.5	0.40	50.8	57.0	3.18	215.3	241.6	2.56
12.7	14.3	0.40	53.8	60.4	3.18	228.1	256.0	2.56
13.5	15.1	0.40	57.0	64.0	3.18	241.6	271.2	2.56
14.3	16.0	0.40	60.4	67.8	3.18	256.0	287.4	2.56
15.1	17.0	0.40	64.0	71.8	3.18	271.2	304.4	2.56
16.0	18.0	0.40	67.8	76.1	3.18	287.4	322.5	2.56
17.0	19.0	0.40	71.8	80.6	1.40	304.4	341.7	2.56
18.0	20.2	0.40	76.1	85.4	1.40	322.5	362.0	2.56
19.0	21.4	0.40	80.6	90.5	1.40	341.7	383.6	2.56
20.2	22.6	0.40	85.4	95.9	1.40	362.0	406.4	2.56
21.4	24.0	0.40	90.5	101.6	1.40	383.6	430.5	2.56
22.6	25.4	0.40	95.9	107.6	1.40	406.4	456.1	2.56
24.0	26.9	0.40	101.6	114.0	1.40	430.5	483.3	2.56
25.4	28.5	0.40	107.6	120.8	2.40	456.1	512.0	2.56

(CCR 00163)

GIRD1110   3.2.1.7.1.3.0-2   The translational accelerations at the spacecraft side of each instrument sensor unit mount **shall** produce an absolute peak acceleration Shock Response Spectra (SRS) less than the limits set in the On Orbit Operational SRS Acceleration Limits Table below. The limits apply to each orthogonal axis for SRS natural frequencies when using a quality factor, Q, of 50. The SRS is computed after the acceleration is high pass filtered with a fourth order Butterworth filter with a -3dB cut off at 1.0 Hz. Use a logarithmic interpolation for both frequency and acceleration terms in the On Orbit Operational SRS Acceleration Limits Table. *(CCR 00163)*

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GIRD1110   3.2.1.7.1.3.0-2   **On Orbit Operational SRS Acceleration Limits Table**

f (Hz)	SRS Limit (mg)	SRS Limit/ Q (mg)	f (Hz)	SRS Limit (mg)	SRS Limit/ Q (mg)
10	10.0	0.20	138	45.0	0.90
30	10.0	0.20	165	45.0	0.90
30	30.0	0.60	177	140.7	2.81
52	30.0	0.60	198	140.7	2.81
59	135.2	2.70	210	45.0	0.90
66	135.2	2.70	225	45.0	0.90
73	30.0	0.60	236	103.9	2.08
90	30.0	0.60	264	103.9	2.08
90	45.0	0.90	275	45.0	0.90
112	45.0	0.90	285	45.0	0.90
118	102.3	2.05	295	82.2	1.64
132	102.3	2.05	300	82.2	1.64

(CCR 00163)

GIRD158   3.2.1.7.2   ### 3.2.1.7.2 Instrument-to-Spacecraft Disturbances

GIRD159   3.2.1.7.2.1   ### 3.2.1.7.2.1 Instrument Disturbance Torque Limits

GIRD160   3.2.1.7.2.1.0-1   At any time during the operational mode of the spacecraft, the sum of the magnitude of the instrument sensor unit's uncompensated torques and the magnitude of its uncompensated linear forces multiplied by a lever arm of 2 meters **shall** not exceed 1.0 N-m.

GIRD161   3.2.1.7.2.2   ### 3.2.1.7.2.2 Instrument Allowable Angular Momentum

GIRD162   3.2.1.7.2.2.0-1   The magnitude of the instrument unit's uncompensated angular momentum **shall** not exceed 1.0 N-m-sec.

GIRD163   3.2.1.7.2.2.0-2   The instrument contractor will document the angular momentum produced by the instrument in the IDD.

GIRD164   3.2.1.7.2.3   ### 3.2.1.7.2.3 Instrument Disturbances Allocation

GIRD165   3.2.1.7.2.3.0-1   The instrument **shall** not exceed disturbances defined in the UIID given a spacecraft characterized by Laplace domain transfer functions $H_{\theta T}(s)$, $sH_{\theta T}(s)$ and $as^2 H_{\theta T}(s)$ with the parameters in the tables named Parameters for Roll Torques and Rotations about the X Axis, Parameters for Pitch Torques and Rotations about the Y Axis, and Parameters for Yaw Torques and Rotations about the Z Axis.

Filtering the instrument sensor unit torque time history in Newton-meter units with $H_{\theta T}(s)$ estimates the spacecraft pointing error displacement in radian units. Filtering with $sH_{\theta T}(s)$ estimates the spacecraft pointing error rate in radians per second units. Filtering with $as^2 H_{\theta T}(s)$ estimates the spacecraft linear acceleration at a mount in meters per second per second units. When filtering roll axis torques with $H_{\theta T}(s)$, $sH_{\theta T}(s)$ and $as^2 H_{\theta T}(s)$, use table Parameters for Roll Torques and Rotations about the X Axis. When filtering pitch, use table Parameters for Pitch Torques and Rotations about the Y Axis. When filtering yaw, use table Parameters for Yaw Torques and Rotations about the Z Axis. Transfer function $H_{\theta T}(s)$ is

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GIRD165	3.2.1.7.2.3.0-1	plotted in Figure Torque to Spacecraft Pointing Error Transfer Functions for roll, pitch and yaw.

Torque to Angular Displacement Transfer Function

$$\frac{\theta(s)}{T(s)} = H_{\theta T}(s)$$

Torque to Angular Rate Transfer Function

$$\frac{\dot{\theta}(s)}{T(s)} = sH_{\theta T}(s)$$

Torque to Translational Acceleration Transfer Function

$$\frac{\ddot{x}(s)}{T(s)} = as^2 H_{\theta T}(s)$$

where

$$H_{\theta T}(s) = \sum_{i=1}^{n} \frac{1/J_i}{s^2 + 2\zeta_i \omega_i s + \omega_i^2} \quad \text{and} \quad \omega_i = 2\pi f_i$$

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GIRD165	3.2.1.7.2.3.0-1	

Parameters for Roll Torques and Rotations about the X Axis

a (m)	n	i	f_i (Hz)	ζ_i (%)	J_i (kg-m^2)
1.5	12	1	0.01	30.0	4721
		2	0.40	2.0	10733
		3	1.34	0.1	59081
		4	1.92	0.1	34514
		5	13.24	0.1	972
		6	16.54	0.1	732
		7	23.56	0.1	3468
		8	30.55	0.1	5017
		9	30.91	0.1	2975
		10	31.00	0.1	1313
		11	31.17	0.1	1204
		12	39.36	0.1	25821

Parameters for Pitch Torques and Rotations about the Y Axis

a (m)	n	i	f_i (Hz)	ζ_i (%)	J_i (kg-m^2)
1.5	9	1	0.01	30.0	3203
		2	1.35	0.1	89061
		3	13.24	0.1	820
		4	16.54	0.1	1620
		5	23.56	0.1	985
		6	30.55	0.1	55722
		7	30.91	0.1	8377
		8	31.00	0.1	3897
		9	31.17	0.1	6104

Parameters for Yaw Torques and Rotations about the Z Axis

a (m)	n	i	f_i (Hz)	ζ_i (%)	J_i (kg-m^2)
1.5	5	1	0.01	30.0	4873
		2	0.64	2.0	10001
		3	1.35	0.1	76471
		4	31.00	0.1	45578
		5	39.36	0.1	73013

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GIRD165	3.2.1.7.2.3.0-1	

Torque to Spacecraft Pointing Error Transfer Functions
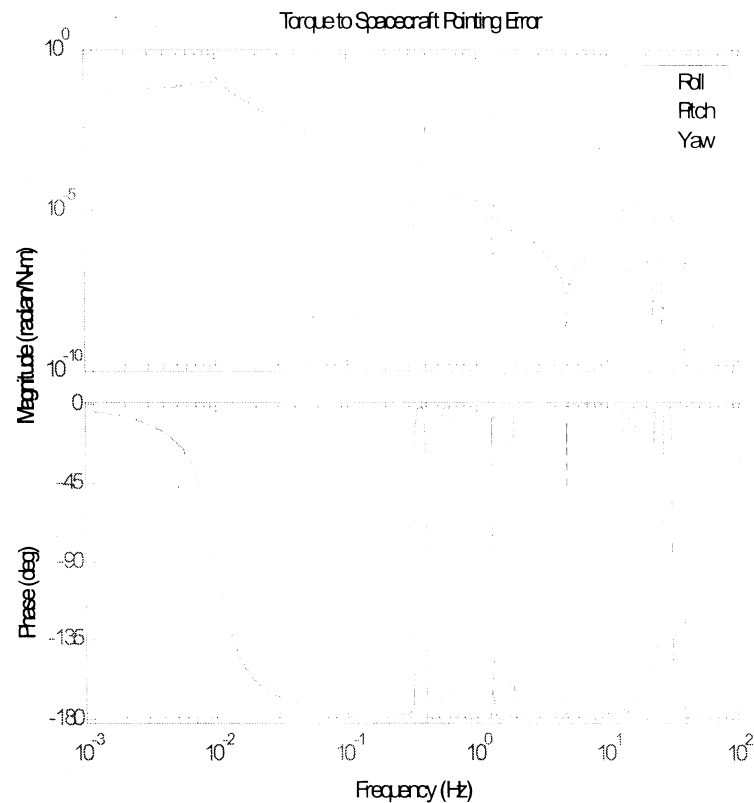
GIRD166	3.2.1.8	**3.2.1.8 Reserved _(CCR 00095)_**
GIRD1112	3.2.1.8.0-1	Reserved _(CCR 00077) (CCR 00095)_
GIRD1113	3.2.1.8.0-2	Reserved _(CCR 00077) (CCR 00095)_
GIRD1114	3.2.1.8.1	**3.2.1.8.1 Reserved _(CCR 00095)_**
GIRD1115	3.2.1.8.1.1	**3.2.1.8.1.1 Reserved _(CCR 00095)_**
GIRD1116	3.2.1.8.1.1.0-1	Reserved _(CCR 00077) (CCR 00095)_
GIRD1138	3.2.1.8.1.1.0-2	Reserved _(CCR 00077) (CCR 00095)_
GIRD1117	3.2.1.8.1.1.0-3	Reserved _(CCR 00077) (CCR 00095)_
GIRD1118	3.2.1.8.1.1.0-4	Reserved _(CCR 00077) (CCR 00095)_
GIRD1142	3.2.1.8.1.1.0-5	Reserved _(CCR 00077) (CCR 00095)_
GIRD1143	3.2.1.8.1.1.0-6	Reserved _(CCR 00077) (CCR 00095)_

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GIRD1144	3.2.1.8.1.1.0-7	Reserved *(CCR 00077) (CCR 00095)*
GIRD1145	3.2.1.8.1.1.0-8	Reserved *(CCR 00077) (CCR 00095)*
GIRD1119	3.2.1.8.1.2	**3.2.1.8.1.2 Reserved *(CCR 00077)* *(CCR 00095)***
GIRD1120	3.2.1.8.1.2.0-1	Reserved *(CCR 00077) (CCR 00095)*
GIRD1121	3.2.1.8.1.3	**3.2.1.8.1.3 Reserved *(CCR 00095)***
GIRD1122	3.2.1.8.1.3.0-1	Reserved *(CCR 00095)*
GIRD1123	3.2.1.8.1.4	**3.2.1.8.1.4 Reserved *(CCR 00095)***
GIRD1124	3.2.1.8.1.4.0-1	Reserved *(CCR 00095)*
GIRD1125	3.2.1.8.1.4.0-2	Reserved *(CCR 00095)*
GIRD1126	3.2.1.8.1.4.0-3	Reserved *(CCR 00095)*
GIRD1127	3.2.1.8.2	**3.2.1.8.2 Reserved *(CCR 00095)***
GIRD1128	3.2.1.8.2.1	**3.2.1.8.2.1 Reserved *(CCR 00095)***
GIRD1129	3.2.1.8.2.1.0-1	Reserved *(CCR 00095)*
GIRD1130	3.2.1.8.2.1.0-2	Reserved *(CCR 00095)*
GIRD1131	3.2.1.8.2.2	**3.2.1.8.2.2 Reserved *(CCR 00095)***
GIRD1132	3.2.1.8.2.2.0-1	Reserved *(CCR 00095)*
GIRD1133	3.2.1.8.2.2.0-2	Reserved *(CCR 00095)*
GIRD1111	3.2.1.9	**3.2.1.9 Flight and Non-Flight Equipment**
GIRD167	3.2.1.9.0-1	The instrument contractor will provide information on all items to be installed or removed prior to flight for identification in the IDD.
GIRD168	3.2.1.9.0-2	The instrument contractor will tag all non-flight items to be removed prior to flight with a red tag stating, **"Remove Before Flight"**.
GIRD169	3.2.1.9.0-3	The instrument contractor will tag all flight items to be installed prior to flight with a green tag stating, **"Install Before Flight"**.
GIRD170	3.2.2	**3.2.2 Thermal**
GIRD171	3.2.2.1	**3.2.2.1 Thermal Control Concept**

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD172	3.2.2.1.0-1	The instrument units installed on the spacecraft bus fall under one of the following categories: a) Thermally-independent units are conductively and radiatively decoupled from the spacecraft and reject their heat directly to space. b) Thermally-coupled units dissipate their heat to the spacecraft. In general: • Instrument <u>electronic units</u> are thermally-coupled. • Instrument <u>sensor units</u> are thermally-independent. The instrument contractor will document the thermal control concept in the IDD. *(CCR 00250)*
GIRD844	3.2.2.1.0-2	The spacecraft **shall** maintain the instrument units mounting surface temperature within instrument Mission Allowable Temperatures (MAT) during instrument operation.
GIRD845	3.2.2.1.0-3	The spacecraft **shall** maintain the instrument units mounting surface temperature within non-operational limits when the instrument is non-operating.
GIRD173	3.2.2.1.1	### 3.2.2.1.1 Independent Thermal Control Design
GIRD1059	3.2.2.1.1.0-1	The instrument contractor is responsible for independent thermal unit thermal design.
GIRD1141	3.2.2.1.1.0-2	Thermally-independent instrument units **shall** restrict heater power consumption within overall power limitations.
GIRD178	3.2.2.1.2	### 3.2.2.1.2 Coupled Thermal Control Design
GIRD179	3.2.2.1.2.0-1	The instrument contractor is responsible for thermally coupled unit internal thermal design. For coupled units, the instrument contractor will provide unit internal design information including internal dissipation, couplings, and interface heat flow so the spacecraft contractor can appropriately interface with the unit.
GIRD180	3.2.2.2	### 3.2.2.2 Heat Transfer
GIRD182	3.2.2.2.0-1	The net heat transfer (conducted and radiated) is the total amount of heat transferred between the instrument units and the spacecraft.
GIRD181	3.2.2.2.1	### 3.2.2.2.1 Independent Unit - Heat Transfer
GIRD183	3.2.2.2.1.0-1	The net heat transfer between the independent unit and spacecraft includes radiation between adjacent instrument and spacecraft surfaces, conduction via the mechanical interface and conduction via the instrument harness.
GIRD184	3.2.2.2.2	### 3.2.2.2.2 Independent Unit - Net Heat Transfer
GIRD185	3.2.2.2.2.0-1	For Independent Units, the net heat transfer averaged over the instrument independent unit interface plane area **shall** be less than 15.5 watts/m².
GIRD186	3.2.2.2.3	### 3.2.2.2.3 Coupled Unit Heat Transfer

| ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD187	3.2.2.2.3.0-1	The spacecraft **shall** provide a heat rejection path for thermally coupled units. Units with less than 5 watts dissipation may rely on radiative rather than conductive heat rejection subject to agreement of the instrument and spacecraft contractors. Where conduction is the principal heat transfer mechanism, the interface temperature is the spacecraft side of the mechanical interface. For radiatively-coupled units (accommodated within the spacecraft) the interface temperature is the average local environment surrounding unit external surfaces.
GIRD188	3.2.2.2.4	### 3.2.2.2.4 Coupled Unit - Net Heat Transfer
GIRD189	3.2.2.2.4.0-1	The net heat transfer collectively from the instrument's coupled units to the spacecraft **shall** not exceed the values dictated by the UIID.
GIRD190	3.2.2.2.5	### 3.2.2.2.5 Coupled Unit - Heat Transfer Flux Density
GIRD191	3.2.2.2.5.0-1	For conductively-coupled units, peak local heat transfer fluxes conducted to the spacecraft in excess of 0.25 watts per square centimeter **shall** be coordinated with the spacecraft contractor and subject to NASA concurrence.
GIRD192	3.2.2.2.5.0-2	Where this watt density is exceeded, the spacecraft contractor will provide a detailed description of the heat transport features and SINDA model of the spacecraft side interface.
GIRD193	3.2.2.3	### 3.2.2.3 Interface Temperatures

GIRD201	3.2.2.3.0-1	For planning and preliminary design purposes, the interface temperature (spacecraft side) for Earth-viewing instruments **shall** be:
		
		    a) 0°C to 40°C during operation
		    b) -30°C to 50°C during non-operation

GIRD203	3.2.2.4	### 3.2.2.4 Temperature Monitoring
GIRD204	3.2.2.4.1	### 3.2.2.4.1 Mechanical Interface Temperature Monitoring
GIRD205	3.2.2.4.1.0-1	The instrument contractor will select a unit attachment point and identify it on the IDD.
GIRD206	3.2.2.4.1.0-2	The spacecraft **shall** have a temperature sensor adjacent to this attachment point (on the spacecraft side) to serve as the interface temperature sensor.
GIRD207	3.2.2.4.2	### 3.2.2.4.2 Instrument Critical Temperatures
GIRD208	3.2.2.4.2.0-1	The spacecraft **shall** convey instrument critical temperatures via the spacecraft telemetry stream.
GIRD209	3.2.2.4.2.0-2	The type(s) of temperature sensor and excitation will be collectively selected by the instrument contractor and spacecraft contractor and is subject to NASA concurrence.
GIRD210	3.2.2.4.2.0-3	The instrument contractor will procure and install the critical temperature sensors.
GIRD211	3.2.2.4.2.0-4	The instrument contractor will furnish temperature calibration coefficients for the critical temperature sensors and document them in the IDD.
GIRD212	3.2.2.4.3	### 3.2.2.4.3 Instrument Non-Critical Temperatures
GIRD213	3.2.2.4.3.0-1	The instrument **shall** report instrument non-critical temperatures in telemetry.
GIRD216	3.2.2.5	### 3.2.2.5 Heater Power and Heater Control

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD217	3.2.2.5.0-1	The two categories of instrument heaters are: • Operational heaters controlled by the instrument • Non-operational (survival) heaters powered by the spacecraft When the instrument is OFF, the instrument survival heaters **shall** consume no more than 35% of nominal operational power (of the independent units) averaged over every 72 minute period.
GIRD219	3.2.2.6	### 3.2.2.6 Thermal Interfaces
GIRD220	3.2.2.6.1	### 3.2.2.6.1 Mounting Details
GIRD221	3.2.2.6.1.0-1	The spacecraft contractor will document in the ICD properties of any thermally conductive or isolating materials used at the interface of the instrument unit. *(CCR 00021)*
GIRD223	3.2.2.6.2	### 3.2.2.6.2 Contact Area
GIRD224	3.2.2.6.2.0-1	Unit mounting contact area on the instrument and spacecraft **shall** be unpainted.
GIRD225	3.2.2.6.3	### 3.2.2.6.3 Interstitial Materials
GIRD226	3.2.2.6.3.0-1	The spacecraft contractor will integrate the instrument units onto the spacecraft including application of any interstitial materials as conductive enhancements. Selection and application of any interface materials require the concurrence of the instrument contractor and spacecraft contractor.
GIRD1079	3.2.2.7	### 3.2.2.7 Multi-layer Insulation
GIRD1080	3.2.2.7.0-1	Multi-layer insulation (MLI) **shall** have provisions for electrical grounding to prevent ESD.
GIRD1081	3.2.2.7.0-2	MLI vents **shall** be located and oriented consistent with observatory contamination requirements.
GIRD227	3.2.3	## 3.2.3 Instrument Electrical Power
GIRD1171	3.2.3.0-1	All instrument electrical power interface requirements **shall** be specified at the instrument input power connectors. *(CCR 00161B)*
GIRD1172	3.2.3.1	### 3.2.3.1 Electrical Power Interfaces
GIRD230	3.2.3.1.0-1	The spacecraft **shall** supply functionally independent, redundant operational power buses to each instrument for normal instrument operation. *(CCR 00161B)*
GIRD1173	3.2.3.1.0-2	The instrument **shall** utilize only one side of the operational power bus at a time. *(CCR 00161B)*
GIRD1174	3.2.3.1.0-3	Inadvertent simultaneous application of both primary and redundant Instrument Operational Power by the spacecraft **shall** not cause damage to the instrument. *(CCR 00161B)*
GIRD1175	3.2.3.1.0-4	The spacecraft **shall** supply functionally independent, redundant survival power buses to each instrument to power the instrument survival heaters. *(CCR 00161B)*
GIRD1176	3.2.3.1.0-5	The instrument **shall** only utilize survival heater power for heaters and associated passive control circuitry which maintains the instrument at its minimum turn-on temperature. *(CCR 00161B)*
GIRD1177	3.2.3.1.0-6	Following initial activation both sides of the instrument survival bus **shall** be powered at all times by the spacecraft. *(CCR 00161B)*
GIRD1178	3.2.3.1.0-7	The spacecraft power system **shall** accommodate instrument operational bus turn on and peak survival bus loading simultaneously for each instrument. *(CCR 00161B)*

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD1179	3.2.3.1.0-8	The spacecraft power system **shall** accommodate the sequential turn on/activation of all instruments in any order from any combination of operating and survival modes. *(CCR 00161B)*
GIRD1180	3.2.3.1.0-9	Following the initial thermal transition from survival mode following instrument turn-on, the instrument design **shall** not depend on the use of the survival heater buses when operational power is active. *(CCR 00161B)*
GIRD1181	3.2.3.2	**3.2.3.2 Power Specifications *(CCR 00161B)***
GIRD1182	3.2.3.2.1	**3.2.3.2.1 Power Definitions *(CCR 00161B)***
GIRD1183	3.2.3.2.1.0-1	The following definitions **shall** be used when calculating average power, maximum power, and peak current values. Average Power (Operational) - The total power into an instrument averaged over any 5 minute period. Average Power (Survival) - The total power into an instrument averaged over any 72 minute period. Maximum Power (Operational or Survival) - The total power into an instrument averaged over any 20ms period. Peak Current (Operational) - The maximum (never to be exceeded) current drawn by the instrument. Peak current is typically calculated as 1.5 times the maximum power at worst case nominal voltage (26 Vdc). *(CCR 00161B)*
GIRD1184	3.2.3.2.2	**3.2.3.2.2 Power Characteristics *(CCR 00161B)***
GIRD1185	3.2.3.2.2.1	**3.2.3.2.2.1 Voltage *(CCR 00161B)***
GIRD1186	3.2.3.2.2.1.1	**3.2.3.2.2.1.1 Instrument Voltage *(CCR 00161B)***
GIRD242	3.2.3.2.2.1.1.0-1	The spacecraft **shall** supply a DC voltage at the instrument operational power input connector. *(CCR 00161B)*
GIRD1187	3.2.3.2.2.1.1.0-2	At any time after the initial turn on of the instrument, the spacecraft **shall** control the voltage at the instrument operational power input connector to 28 volts ± 2 volts for any condition of instrument load current (including transients). *(CCR 00161B)*
GIRD243	3.2.3.2.2.1.1.0-3	The instrument **shall** operate in accordance with the instrument performance specification within the range of 28 volts Vdc ± 2 volts at the instrument operational power input connector. *(CCR 00161B)*
GIRD356	3.2.3.2.2.1.1.0-4	The spacecraft **shall** supply a steady-state dc voltage of TBD Vdc ± TBD Vdc at the instrument survival heater power input connector. *(CCR 00161B)*
GIRD357	3.2.3.2.2.1.1.0-5	The instrument **shall** operate the instrument survival heaters and associated passive control circuitry to maintain minimum turn-on temperatures with a steady-state dc voltage of TBD Vdc ± TBD Vdc applied at the instrument survival heater power input connector. *(CCR 00161B)*
GIRD1188	3.2.3.2.2.1.2	**3.2.3.2.2.1.2 Voltage Transients *(CCR 00161B)***
GIRD1207	3.2.3.2.2.1.2.0-1	The spacecraft **shall** limit the voltage rate of rise to less than 0.01 V/µsec when powering on instrument operational power interfaces. *(CCR 00161B)*
GIRD1208	3.2.3.2.2.1.2.0-2	During the initial ramp voltage power up of the instrument (0.01 V/µsec) the input voltage to the instrument **shall** not drop more than 0.5 volts. *(CCR 00161B)*

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GIRD265	3.2.3.2.2.1.3	**3.2.3.2.2.1.3 Operational Power Voltage Ripple**
GIRD266	3.2.3.2.2.1.3.0-1	The spacecraft **shall** control the instrument operational power voltage ripple to levels that are less than or equal to levels specified in the Instrument Operational Power Voltage Ripple Figure below for all operating modes with all spacecraft power system buses loaded at their maximum steady-state on-orbit load. *(CCR 00161B)*

Instrument Operational Power Voltage Ripple
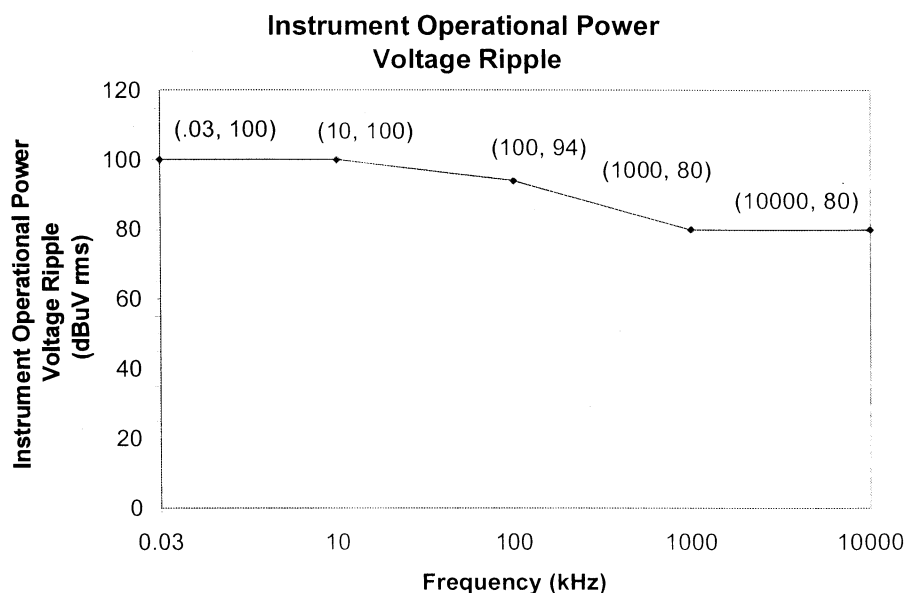
GIRD270	3.2.3.2.2.1.3.0-2	The test equipment used for the voltage ripple test measurements **shall** comply with sections 4.3.10, 4.3.10.1, 4.3.10.2, and 4.3.10.3.1 of MIL-STD-461 E. *(CCR 00161B)*
GIRD1189	3.2.3.2.2.1.3.0-3	The voltage ripple test measurements **shall** comply with the frequency ranges and corresponding bandwidths, dwell times, and minimum measurement times for the analog measurement receiver as defined in section 4.3.10.3.1 of MIL-STD-461 E. *(CCR 00161B)*
GIRD1190	3.2.3.2.2.1.3.0-4	Emission identification **shall** be in accordance with section 4.3.10.3.2 of MIL-STD-461 E.. *(CCR 00161B)*
GIRD1191	3.2.3.2.2.1.3.0-5	The frequency scanning for the voltage ripple measurements **shall** comply with section 4.3.10.3.3 of MIL-STD-461 E. *(CCR 00161B)*
GIRD1192	3.2.3.2.2.1.3.0-6	Voltage ripple test measurement data **shall** be presented in accordance with section 4.3.10.3.4 of MIL-STD-461 E. *(CCR 00161B)*
GIRD1193	3.2.3.2.2.1.4	**3.2.3.2.2.1.4 Abnormal Operation Voltage Limits *(CCR 00161B)***
GIRD1194	3.2.3.2.2.1.4.0-1	Under abnormal failure mode conditions the spacecraft **shall** limit the maximum operational power supply voltage to 50 Vdc with maximum durations of 10 ms. *(CCR 00161B)*
GIRD262	3.2.3.2.2.1.4.0-2	Under abnormal failure mode conditions the spacecraft **shall** limit the steady state operational power supply voltage to 40 V indefinitely. *(CCR 00161B)*

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD264	3.2.3.2.2.1.4.0-3	The instrument **shall** survive without damage following exposure to the abnormal operational voltage limits cited in GIRD1194 [3.2.3.2.2.1.4.0-1] and GIRD262 [3.2.3.2.2.1.4.0-2]. *(CCR 00161B)*
GIRD943	3.2.3.2.2.1.5	**3.2.3.2.2.1.5 Voltage Power Source Impedance *(CCR 00161B)***
GIRD944	3.2.3.2.2.1.5.0-1	The spacecraft **shall** control its instrument operational power source impedance to the levels specified in the Spacecraft's Instrument Operational Power Source Impedance Figure below.

Spacecraft's Instrument Operational Power Source Impedance Figure
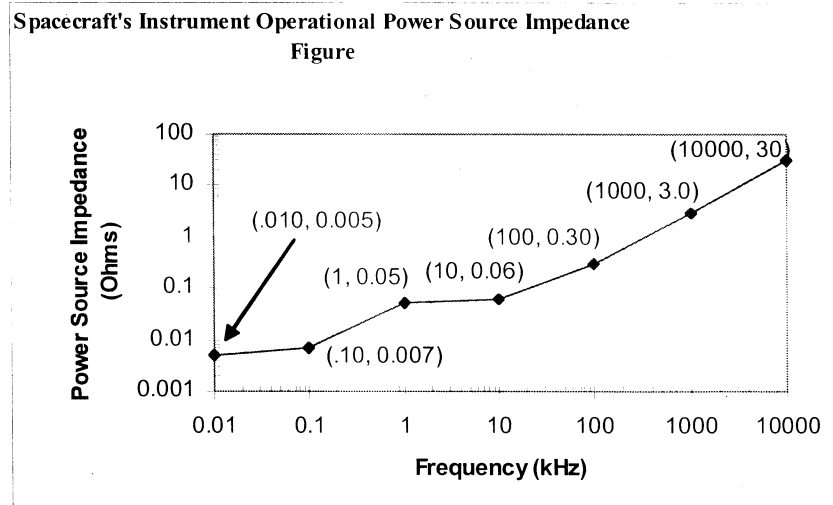
		The actual source impedance the instrument will see at the instrument/spacecraft interface will be the source impedance in the figure above modified by the additional impedance of the spacecraft power distribution hardware and the additional impedance of the harness unique to each instrument. These instrument unique spacecraft source impedance values will be documented in the spacecraft to instrument ICDs. *(CCR 00161B)*
GIRD1195	3.2.3.2.2.1.5.0-2	The input impedance of the instrument will be coordinated with the spacecraft provider and documented in the spacecraft to instrument ICD. The instrument supplier should consider input filter design, DI/DT requirements, and negative impedance loading of the instrument power conditioning hardware to mitigate potential stability concerns. *(CCR 00161B)*
GIRD1196	3.2.3.2.2.2	**3.2.3.2.2.2 Current *(CCR 00161B)***
GIRD277	3.2.3.2.2.2.1	**3.2.3.2.2.2.1 Operational Power Transients *(CCR 00161B)***
GIRD1209	3.2.3.2.2.2.1.0-1	The amplitude of any instrument operational power current transient **shall** not exceed the peak current value allocated in the UIIDs. *(CCR 00161B)*
GIRD1197	3.2.3.2.2.2.1.0-2	The instrument **shall** limit any change in operational power current at any time (including initial power turn-on) to no more than 0.2A/μs. *(CCR 00161B)*
GIRD1198	3.2.3.2.2.2.1.0-3	The instrument **shall** control the maximum delta change in operational current at any time to 50% of the peak current allocated in the UIID. *(CCR 00161B)*
GIRD1199	3.2.3.2.3	**3.2.3.2.3 Power Distribution, Control, and Status *(CCR 00161B)***
GIRD232	3.2.3.2.3.1	**3.2.3.2.3.1 Operational Power Lines *(CCR 00161B)***

ID	Object Number	**417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)**

GIRD233   3.2.3.2.3.1.0-1   The spacecraft **shall** supply single fault tolerant operational power distribution to the instrument for primary and redundant instrument operational power sources as specified in the Operational Power Lines Figure below.

Operational Power Lines Figure
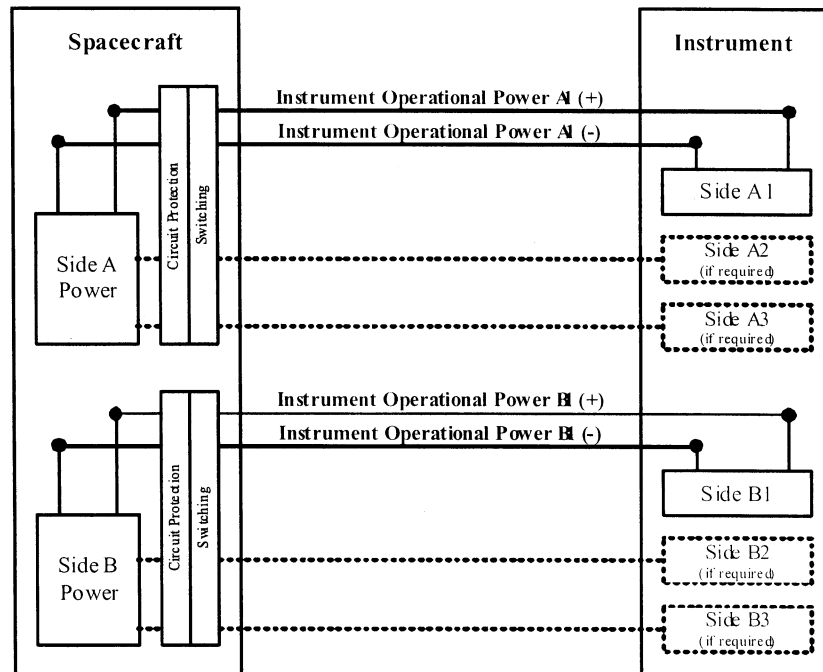
Note: Single-Sided (non-redundant) instruments are required to accommodate both primary and redundant spacecraft operational power at the spacecraft-instrument interface and should provide any associated internal power distribution circuitry required to utilize either spacecraft source. *(CCR 00161B)*

GIRD1200   3.2.3.2.3.1.0-2   The spacecraft **shall** provide each instrument with a maximum of three instrument operational power sources. *(CCR 00161B)*

GIRD926   3.2.3.2.3.1.0-3   The spacecraft **shall** independently sense and telemeter the instrument operational power current being supplied to each primary instrument operational power source. *(CCR 00161B)*

GIRD936   3.2.3.2.3.1.0-4   The spacecraft **shall** independently sense and telemeter the instrument operational power current being supplied to each redundant instrument operational power source. *(CCR 00161B)*

GIRD1156   3.2.3.2.3.1.0-5   The spacecraft and instruments **shall** have independent wire harnesses and connectors for the primary and redundant power cables. *(CCR 00108)*

GIRD234   3.2.3.2.3.2   **3.2.3.2.3.2 Operational Power On/Off Functionality *(CCR 00161B)***

GIRD235   3.2.3.2.3.2.0-1   The spacecraft **shall** provide redundant commanding to switch instrument operational power on and off to the instrument operational power input connector.

GIRD236   3.2.3.2.3.2.0-2   The spacecraft **shall** provide redundant instrument operational power on and off status telemetry.

GIRD237   3.2.3.2.3.2.0-3   The spacecraft **shall** supply redundant switching of instrument operational power to the instrument operational power input connector.

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD238	3.2.3.2.3.2.0-4	The instrument **shall** accept switched power at the instrument operational power input
GIRD239	3.2.3.2.3.3	**3.2.3.2.3.3 Operational Power Overcurrent Protection (CCR 00161B)**
GIRD1201	3.2.3.2.3.3.0-1	The spacecraft **shall** provide protection of the spacecraft power system by providing overcurrent protection on each instrument operational power connection. *(CCR 00161B)*
GIRD1202	3.2.3.2.3.3.0-2	The size of the spacecraft provided operational power overcurrent devices for each instrument **shall** be documented in the ICD. *(CCR 00161B)*
GIRD240	3.2.3.2.3.3.0-3	Operational Power harness wire sizes **shall** be consistent with overcurrent protection device sizes. *(CCR 00161B)*
GIRD345	3.2.3.2.3.4	**3.2.3.2.3.4 Survival Heater Power Lines (CCR 00161B)**
GIRD346	3.2.3.2.3.4.0-1	The spacecraft **shall** supply single fault tolerant survival heater power distribution to the instrument for primary and redundant instrument survival heater power sources as specified in the Survival Heater Power Lines Figure below.

Survival Heater Power Lines Figure
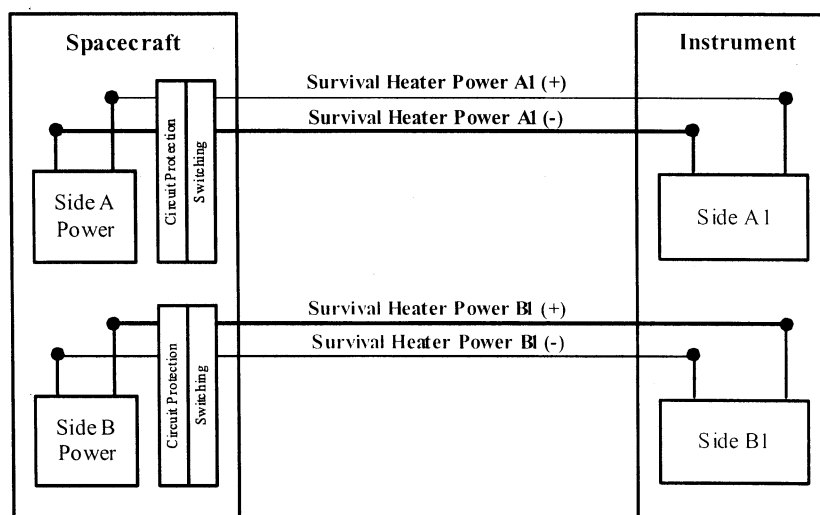
(CCR 00161B)

ID	Object Number	
GIRD1203	3.2.3.2.3.4.0-2	The spacecraft **shall** independently sense and telemeter the instrument survival heater power current being supplied to each primary survival heater power source. *(CCR 00161B)*
GIRD1204	3.2.3.2.3.4.0-3	The spacecraft **shall** independently sense and telemeter the instrument survival heater power current being supplied to each redundant instrument survival heater power source. *(CCR 00161B)*
GIRD348	3.2.3.2.3.5	**3.2.3.2.3.5 Survival Heater Power On/Off Functionality (CCR 00161B)**
GIRD349	3.2.3.2.3.5.0-1	The spacecraft **shall** provide redundant commanding to switch instrument survival heater power on and off to the instrument survival heater power input connector. *(CCR 00161B)*
GIRD350	3.2.3.2.3.5.0-2	The spacecraft **shall** provide redundant instrument survival heater power on and off status telemetry. *(CCR 00161B)*

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD351	3.2.3.2.3.5.0-3	The spacecraft **shall** supply redundant switching of instrument survival heater power to the instrument survival heater power input connector.
GIRD352	3.2.3.2.3.5.0-4	The instrument **shall** accept switched power at the instrument survival heater power input connector.
GIRD353	3.2.3.2.3.6	**3.2.3.2.3.6 Survival Heater Power Overcurrent Protection *(CCR 00161B)***
GIRD1205	3.2.3.2.3.6.0-1	The spacecraft **shall** provide protection of the spacecraft power system by providing overcurrent protection on each instrument survival heater power connection. *(CCR 00161B)*
GIRD1206	3.2.3.2.3.6.0-2	The size of the spacecraft provided survival heater power overcurrent devices for each instrument **shall** be documented in the ICD. *(CCR 00161B)*
GIRD354	3.2.3.2.3.6.0-3	Survival Heater Power harness wire sizes **shall** be consistent with overcurrent protection device sizes. *(CCR 00161B)*.
GIRD400	3.2.4	**3.2.4 Instrument Electrical Power Grounding**
GIRD401	3.2.4.1	**3.2.4.1 Instrument Operational Power Grounding**

ID	Object Number	**417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)**
GIRD402	3.2.4.1.0-1	The instrument electrical power grounding **shall** be in accordance with the Electrical Grounding Figure.

Electrical Grounding Figure
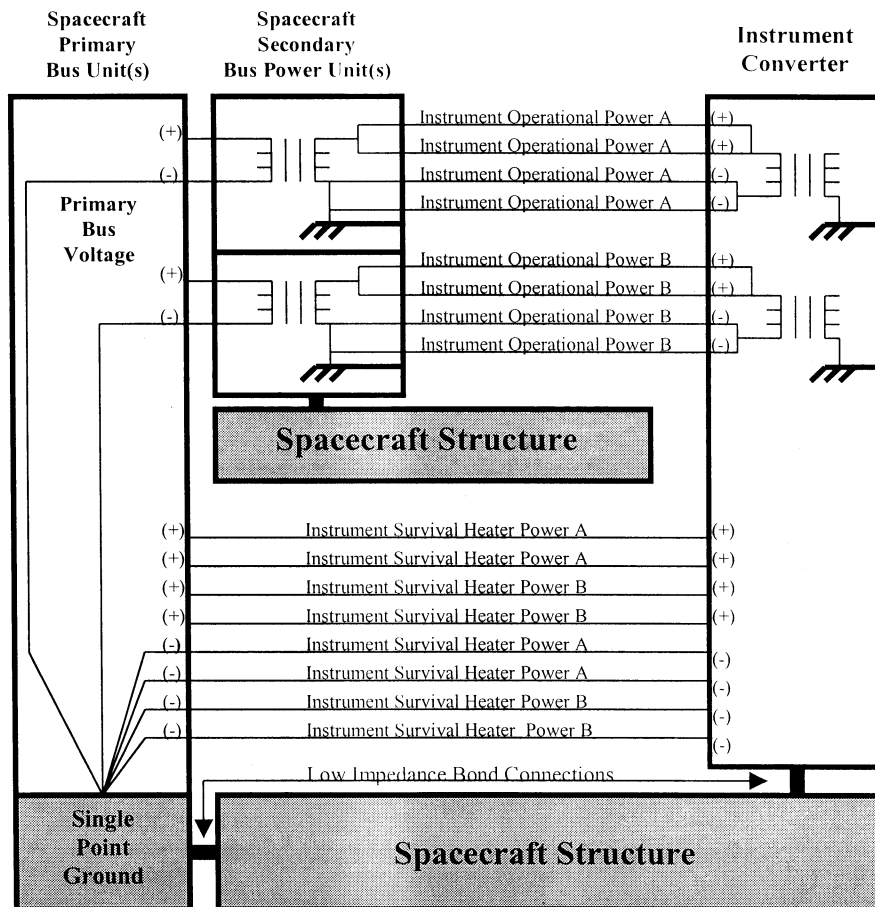
GIRD403	3.2.4.1.0-2	The spacecraft **shall** connect each instrument operational power return to the chassis of the spacecraft secondary bus power unit.
GIRD947	3.2.4.1.0-3	The spacecraft **shall** connect the spacecraft primary bus return(s) to the spacecraft single point ground.
GIRD1058	3.2.4.1.0-4	The spacecraft **shall** control the dc resistance of each primary bus return connection to the single point ground to less than 2.5 milliohms. *(CCR 00008A)*
GIRD404	3.2.4.1.0-5	The spacecraft **shall** control the dc resistance between the spacecraft's instrument operational power return at the spacecraft's secondary power bus unit connector and the spacecraft secondary bus power unit chassis to less than 2.5 milliohms. *(CCR 00008A)*
GIRD972	3.2.4.1.0-6	The spacecraft **shall** supply a low impedance bond connection with a dc resistance of less than 2.5 milliohms between the spacecraft secondary power unit chassis and the spacecraft structure. *(CCR 00008A)*

| ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD405	3.2.4.1.0-7	The instrument **shall** isolate the instrument operational power returns from the instrument chassis with a dc resistance greater than 1 megohm.
GIRD410	3.2.4.2	### 3.2.4.2 Instrument Survival Heater Power Grounding
GIRD411	3.2.4.2.0-1	The spacecraft **shall** connect each instrument survival heater power return at spacecraft's primary bus unit connector to the spacecraft's primary bus return with a dc resistance of less than 2.5 milliohms. *(CCR 00008A)*
GIRD412	3.2.4.2.0-2	Reserved *(CCR 00008A)*
GIRD948	3.2.4.2.0-3	The spacecraft **shall** supply a low impedance bond connection with a dc resistance of less than 2.5 milliohms between the single point ground and the spacecraft structure. *(CCR 00008A)*
GIRD413	3.2.4.2.0-4	The instrument **shall** isolate the instrument survival heater power returns from the instrument chassis with a dc resistance greater than 1 megohm.
GIRD414	3.2.4.3	### 3.2.4.3 Instrument Secondary Power Grounding
GIRD415	3.2.4.3.0-1	The instrument **shall** isolate the instrument secondary power returns from the instrument operational power and instrument survival heater power returns with a dc resistance greater than 1 megohm.
GIRD416	3.2.4.3.0-2	The spacecraft **shall** supply a low impedance bond connection with a dc resistance of less than 2.5 milliohm between the spacecraft structure and instrument chassis mounted directly to the spacecraft structure.
GIRD417	3.2.4.3.0-3	The spacecraft **shall** supply a low impedance electrical connection with a dc resistance of less than 25 milliohms between the spacecraft structure and instrument chassis mounted on other surfaces than the spacecraft structure. Examples of mounting surfaces other than the spacecraft structure are the solar array yoke and an optical bench. *(CCR 00008A)*
GIRD949	3.2.4.4	### 3.2.4.4 Instrument Electrical Signal Grounding
GIRD950	3.2.4.4.1	### 3.2.4.4.1 Instrument Command Grounding
GIRD951	3.2.4.4.1.1	### 3.2.4.4.1.1 Instrument Pulse Command Grounding
GIRD952	3.2.4.4.1.1.0-1	The instrument **shall** isolate the instrument pulse command returns from the instrument operational power returns, instrument survival heater power returns, instrument secondary power returns and instrument serial command returns with a dc resistance greater than 1 megohm.
GIRD954	3.2.4.4.1.2	### 3.2.4.4.1.2 Instrument Serial Command Grounding
GIRD955	3.2.4.4.1.2.0-1	The instrument **shall** isolate the instrument serial command returns in accordance with the European Cooperation For Space Standardization (ECSS) ECSS-E50-12A (Space Wire) standard.
GIRD956	3.2.4.4.1.3	### 3.2.4.4.1.3 Instrument Electro-Explosive Device (EED) Command Grounding
GIRD957	3.2.4.4.1.3.0-1	The instrument **shall** isolate the instrument EED command returns from the instrument pulse command returns, instrument serial command returns, and instrument secondary power returns with a dc resistance greater than 1 megohm.
GIRD958	3.2.4.4.2	### 3.2.4.4.2 Instrument Telemetry Grounding
GIRD959	3.2.4.4.2.1	### 3.2.4.4.2.1 Instrument Analog Telemetry Grounding

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD960	3.2.4.4.2.1.0-1	The instrument **shall** isolate low frequency analog telemetry returns with signal frequency characteristics below 1 MHz from the instrument operational power returns, instrument survival heater power returns, instrument pulse command returns, instrument serial command returns, instrument EED command returns, and serial telemetry returns with a dc resistance greater than 1 megohm.
GIRD961	3.2.4.4.2.2	**3.2.4.4.2.2 Instrument Serial Telemetry Grounding**
GIRD962	3.2.4.4.2.2.0-1	The instrument **shall** isolate the serial telemetry returns in accordance with the European Cooperation For Space Standardization (ECSS) ECSS-E50-12A (Space Wire) standard.
GIRD963	3.2.4.5	**3.2.4.5 Instrument Electrical Accommodations**
GIRD964	3.2.4.5.1	**3.2.4.5.1 Spacecraft/Instrument Interface Harnessing**
GIRD965	3.2.4.5.1.0-1	The spacecraft **shall** supply the required flight harnesses between the instrument and spacecraft. The harness is considered to include the required harness interface connectors, harness wire, harness shielding, insulation wrap, fixing plates, grommets, edge protectors, connector savers, and thermal insulation to make a reliable electrical connection for the entire mission life.
GIRD967	3.2.4.5.2	**3.2.4.5.2 Spacecraft/Instrument Power Interface Harnessing**
GIRD968	3.2.4.5.2.0-1	Reserved *(CCR 00041A)*
GIRD969	3.2.4.5.3	**3.2.4.5.3 Spacecraft/Instrument Telemetry & Command Interface Harnessing**
GIRD970	3.2.4.5.3.0-1	The spacecraft **shall** construct spacecraft/instrument telemetry & command interface harnesses which comply with the European Cooperation For Space Standardization (ECSS) ECSS-E50-12A (Space Wire) standard.
GIRD971	3.2.4.5.3.0-2	The instrument **shall** supply the mating connectors to the spacecraft/instrument telemetry & command interface harnesses which comply with the European Cooperation For Space Standardization (ECSS) ECSS-E50-12A (Space Wire) standard.
GIRD1157	3.2.4.5.3.0-3	The spacecraft and instrument **shall** have independent wire harnesses and connectors for the primary and redundant critical telemetry, discrete, and monitor signal wires. *(CCR 00108)*
GIRD421	3.2.5	**3.2.5 Command and Data Handling**
GIRD422	3.2.5.1	**3.2.5.1 Data Transfer Between the Instrument and Spacecraft**
GIRD423	3.2.5.1.0-1	All data transferred between the instrument and spacecraft **shall** use the European Cooperation For Space Standardization (ECSS) ECSS-E50-12A (Space Wire) standard.
GIRD424	3.2.5.2	**3.2.5.2 SpaceWire Layer Support**
GIRD425	3.2.5.2.0-1	All data transferred between the instrument and the spacecraft **shall** use the European Cooperation For Space Standardization (ECSS) ECSS-E50-12A (Space Wire) standard through the packet layer as a minimum.
GIRD932	3.2.5.2.1	**3.2.5.2.1 Guaranteed Delivery**
GIRD933	3.2.5.2.1.0-1	All data transferred between the instrument and the spacecraft **shall** provide guaranteed data delivery as defined in GOES R Reliable Data Delivery Protocol document. *(CCR 00109)*
GIRD426	3.2.5.3	**3.2.5.3 SpaceWire Data Bus**

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD427	3.2.5.3.0-1	The SpaceWire Data Bus **shall** be a point-to point communications path.

3.2.5.3.1 SpaceWire Redundancy

GIRD977   3.2.5.3.1

GIRD978   3.2.5.3.1.0-1   The SpaceWire bus **shall** be dual redundant cross-strapped between the instrument and spacecraft as shown in the illustration below.
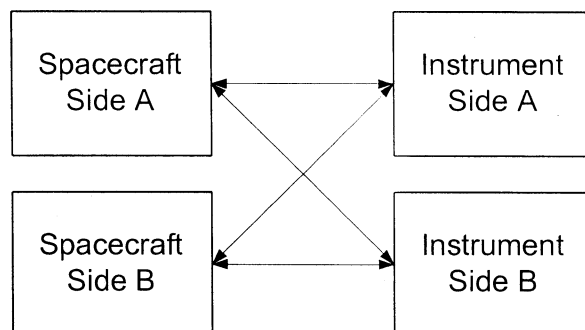
GIRD428   3.2.5.4

3.2.5.4 Source Packet Format

GIRD429   3.2.5.4.0-1   All data transferred over the SpaceWire **shall** use the CCSDS 133.0-B-1 Section 4.1 Protocol Data Unit definition shown in the Source Packet Definition Figure. *(CCR 00158)*

Source Packet Definition Figure

PRIMARY HEADER							SECONDARY HEADER	
PACKET IDENTIFICATION				PACKET SEQUENCE CONTROL				
VERSION NUMBER	TYPE	SEC. HDR FLAG	APPLICATION PROCESS ID	SEQUENCE FLAGS	PACKET SEQUENCE COUNT	PACKET LENGTH	TIME CODE AND ANCILLARY DATA	DATA VARIABLE
3 bits	1 bit	1 bit	11 bits	2 bits	14 bits	16 bits	104 bits	
							13 – 8K octets	

3.2.5.4.1 Source Packet Length

GIRD430   3.2.5.4.1

GIRD431   3.2.5.4.1.0-1   Source packets **shall** be variable length with a maximum data zone of 8192 octets including Secondary Header.

GIRD432   3.2.5.4.2

3.2.5.4.2 Secondary Header Flag

GIRD433   3.2.5.4.2.0-1   The Secondary Header Flag **shall** be set to the value 1. *(CCR 00372)*

GIRD434   3.2.5.4.3

3.2.5.4.3 Source Packet Secondary Header

GIRD435   3.2.5.4.3.0-1   The Source Packet Secondary Header **shall** be as defined in the Secondary Header Figure.

Secondary Header Figure

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD435	3.2.5.4.3.0-1	

SECONDARY HEADER	
TIME CODE	USER FLAGS
72 bits	32 bits

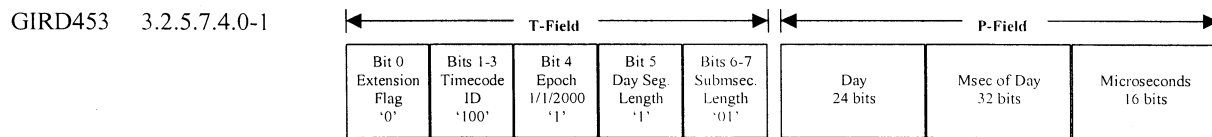| ID	Object Number	
GIRD436	3.2.5.4.4	**3.2.5.4.4 Sequence Flags**
GIRD437	3.2.5.4.4.0-1	The Sequence Flags **shall** be set to the value of 11. Note: Segmentation services are not permitted.
GIRD438	3.2.5.4.5	**3.2.5.4.5 User Defined Flags**
GIRD439	3.2.5.4.5.0-1	The instrument contractor will define Secondary Header User-Defined Flags in the ICD.
GIRD440	3.2.5.5	**3.2.5.5 SpaceWire Data Rate**
GIRD441	3.2.5.5.0-1	Data transferred over the SpaceWire data bus **shall** be clocked at 132Mhz. *(CCR 00229)* Note: This clock rate allows for a 106Mbps data rate accounting for SpaceWire overhead. *(CCR 00229)*
GIRD442	3.2.5.6	**3.2.5.6 Instrument to Spacecraft Data Volume**
GIRD443	3.2.5.6.0-1	The volume of instrument data transmitted to the spacecraft **shall** not exceed the values allocated by the UIID.
GIRD444	3.2.5.7	**3.2.5.7 Pulse Per Second (PPS)**
GIRD445	3.2.5.7.0-1	The spacecraft **shall** provide the instrument a 1 PPS time code sequence accurate to ±10 microseconds relative to UTC.
GIRD446	3.2.5.7.1	**3.2.5.7.1 SpaceWire Time Code Support**
GIRD447	3.2.5.7.1.0-1	The 1 PPS time code sequence **shall** comply with the European Cooperation For Space Standardization (ECSS) ECSS-E50-12A (Space Wire) standard.
GIRD448	3.2.5.7.2	**3.2.5.7.2 PPS Signal Drift**
GIRD449	3.2.5.7.2.0-1	The 1 PPS signal **shall** not drift more than ± 1 μsec over 100 seconds.
GIRD450	3.2.5.7.3	**3.2.5.7.3 Time Message**
GIRD451	3.2.5.7.3.0-1	The spacecraft **shall** transmit a source packet containing the time code to be synchronized by the 1 PPS sequence.
GIRD452	3.2.5.7.4	**3.2.5.7.4 Time Code Format**
GIRD453	3.2.5.7.4.0-1	The time code **shall** comply with the CCSDS 301.B-3 Time Code Formats, Day Segmented format in the Time Code Format Figure.

Time Code Format Figure

ID	Object Number	**417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)**

GIRD453 3.2.5.7.4.0-1

◄——————— T-Field ———————►					◄——————— P-Field ———————►		
Bit 0 Extension Flag '0'	Bits 1-3 Timecode ID '100'	Bit 4 Epoch 1/1/2000 '1'	Bit 5 Day Seg. Length '1'	Bits 6-7 Submsec. Length '01'	Day 24 bits	Msec of Day 32 bits	Microseconds 16 bits

Note: The T-Field is implied and not included in the actual time message.

GIRD454 3.2.5.7.5

3.2.5.7.5 Epoch

GIRD455 3.2.5.7.5.0-1

The time code epoch **shall** be January 1, 2000.

GIRD456 3.2.5.7.6

3.2.5.7.6 Distribution Timing

GIRD457 3.2.5.7.6.0-1

The time message **shall** be issued between 500 ms and 800 ms before reception of the SpaceWire time code sequence.

GIRD458 3.2.5.8

3.2.5.8 Ancillary Data

GIRD459 3.2.5.8.0-1

The spacecraft **shall** provide the instruments an ancillary data packet defined in the ICD.

GIRD460 3.2.5.8.1

3.2.5.8.1 Ancillary Packet Rate

GIRD461 3.2.5.8.1.0-1

The Ancillary Packet **shall** be transmitted at 100 packets per second.

GIRD462 3.2.5.9

3.2.5.9 Control and Monitoring

GIRD463 3.2.5.9.0-1

The spacecraft **shall** provide remote access to all critical telemetry and control. *(CCR 00096A)*

Critical telemetry is defined as telemetry points that are required to monitor the instrument in powered off state.

Non-critical telemetry is defined as telemetry points that are required to monitor the instrument in powered on state.

Engineering telemetry are data required to process instrument sensor data to higher level products.

Housekeeping telemetry are data required to monitor instrument operation, health, and safety.

GIRD464 3.2.5.9.1

3.2.5.9.1 Critical Telemetry

GIRD465 3.2.5.9.1.0-1

All temperature and status telemetry required to monitor the health of the instrument will be defined in the ICD.

GIRD469 3.2.5.9.2

3.2.5.9.2 Critical Telemetry Analog Signals

GIRD470 3.2.5.9.2.0-1

The spacecraft **shall** provide up to 16 analog signals to monitor critical temperature points to each instrument.

GIRD471 3.2.5.9.3

3.2.5.9.3 Critical Telemetry Analog Signal Resolution

GIRD472 3.2.5.9.3.0-1

The Critical Telemetry Analog signal resolution **shall** be 12 bits ± 0.5 LSB.

GIRD473 3.2.5.9.4

3.2.5.9.4 Discrete Control Signals

GIRD474 3.2.5.9.4.0-1

The spacecraft **shall** provide up to 16 discrete pulse or level control signals to the instrument. Note: The actual combination of control signals will be documented in the IDD. *(CCR 00165)*

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD475	3.2.5.9.5	**3.2.5.9.5 Discrete Monitor Signals**
GIRD920	3.2.5.9.5.0-1	The spacecraft **shall** provide up to 16 discrete instrument monitor lines to each instrument.
GIRD981	3.2.5.9.6	**3.2.5.9.6 Critical Telemetry Signal Characteristics**
GIRD982	3.2.5.9.6.0-1	Critical telemetry sensors **shall** be sourced, from the spacecraft a current from 0.1 to 10ma programmable in 0.1ma steps.
GIRD983	3.2.5.9.7	**3.2.5.9.7 Discrete Pulse Control Signal Characteristics *(CCR 00165)***
GIRD984	3.2.5.9.7.0-1	The spacecraft provided discrete pulse command ON signal **shall** source 500ma maximum at 28V +/- 3V with 150 msec +/- 50 msec pulse widths. *(CCR 00165)*
GIRD1167	3.2.5.9.8	**3.2.5.9.8 Discrete Level Control Signal Definition *(CCR 00165)***
GIRD1166	3.2.5.9.8.0-1	The spacecraft provided level control signal **shall** consider 0 Volts as an OFF condition and +28 Volts +/- 3 Volts as an ON condition. *(CCR 00165)*
GIRD985	3.2.5.9.9	**3.2.5.9.9 Discrete Monitor Signal Sink Current**
GIRD986	3.2.5.9.9.0-1	Discrete telemetry points monitored by the spacecraft **shall** sink 1ma +/-1%.
GIRD987	3.2.5.9.10	**3.2.5.9.10 Discrete Monitor ON Status**
GIRD988	3.2.5.9.10.0-1	A Telemetry Discrete Monitor point with a current of 0.8ma or greater **shall** be considered in the ON state.
GIRD989	3.2.5.9.11	**3.2.5.9.11 Discrete Monitor OFF Status**
GIRD990	3.2.5.9.11.0-1	A Telemetry Discrete Monitor point with a current of 0.2ma or less **shall** be considered in the OFF state.
GIRD491	3.2.5.9.12	**3.2.5.9.12 Instrument Configuration Commands**
GIRD492	3.2.5.9.12.0-1	The instrument **shall** be configurable by spacecraft issued commands. Note: The instrument may also internally configure itself, reporting its configuration via telemetry.
GIRD493	3.2.5.9.12.1	**3.2.5.9.12.1 Configuration Command Definition**
GIRD494	3.2.5.9.12.1.0-1	The instrument contractor will document instrument configuration commands in the IDD.
GIRD979	3.2.5.9.13	**3.2.5.9.13 Stored Command Processing**
GIRD980	3.2.5.9.13.0-1	All stored command processing services **shall** be provided by the spacecraft.
GIRD558	3.2.6	**3.2.6 Environmental Conditions**
GIRD559	3.2.6.1	**3.2.6.1 On-Orbit Radiation Environment**
GIRD935	3.2.6.1.0-1	The instruments and spacecraft **shall** comply with the on-orbit radiation requirements that are described in the GSFC document 417-R-RPT-0027 titled "The Radiation Environment for Electronic Devices on the GOES-R Series Satellites." *(CCR 00096A)*
GIRD576	3.2.6.2	**3.2.6.2 Launch Environment**

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD577	3.2.6.2.0-1	The instruments and spacecraft **shall** be designed to meet the launch environment described herein. The baseline launch vehicle is planned to be an expendable Delta IV or Atlas V. *(CCR 00096A)*
GIRD578	3.2.6.2.1	### 3.2.6.2.1 Thermal Environment During Launch
GIRD580	3.2.6.2.1.0-1	The fairing inner surface temperatures **shall** not exceed 150°C for 300 (TBR) seconds.
GIRD581	3.2.6.2.1.0-2	The fairing inner surface **shall** radiate to the instrument no more than 1240 W/m² to the instrument for 300 seconds.
GIRD582	3.2.6.2.1.0-3	The instantaneous free molecular heating on instrument surfaces in the velocity vector at the time of fairing separation **shall** not exceed 1135 W/m², 3 sigma.
GIRD583	3.2.6.2.1.0-4	The duration of free molecular heating **shall** be limited to 20 (TBR) seconds after fairing separation
GIRD584	3.2.6.2.2	### 3.2.6.2.2 Pressure Profile
GIRD585	3.2.6.2.2.0-1	The spacecraft contractor will document in the ICD the predicted launch pressure decay time history obtained from the launch vehicle contractor. Inside the launch vehicle fairing, the pressure decays from a maximum of 110 kPa to an orbital minimum of 13 nPa over a period of 100 seconds.
GIRD586	3.2.6.2.2.0-2	The depressurization rate **shall** be less than 2.8 kPa/sec except for a maximum 5 second excursion to 6.2 kPa/sec.
GIRD587	3.2.6.2.3	### 3.2.6.2.3 Flight Acceleration
GIRD588	3.2.6.2.3.0-1	Flight limit loads for each instrument unit **shall** be defined by the spacecraft contractor and recorded in the ICD.
GIRD589	3.2.6.2.3.0-2	The instrument unit interface forces **shall** not exceed those induced by a static acceleration load factor times 9.81 m/s/s in any direction. The acceleration load factor is defined as a logarithmic scale linear interpolation of the values in the Mass Acceleration Curve Table with an absolute limit of 55 g's. The Mass Acceleration Curve Table is plotted in the Mass Acceleration Curve Figure. *(CCR 00081A)*

Mass Acceleration Curve Table

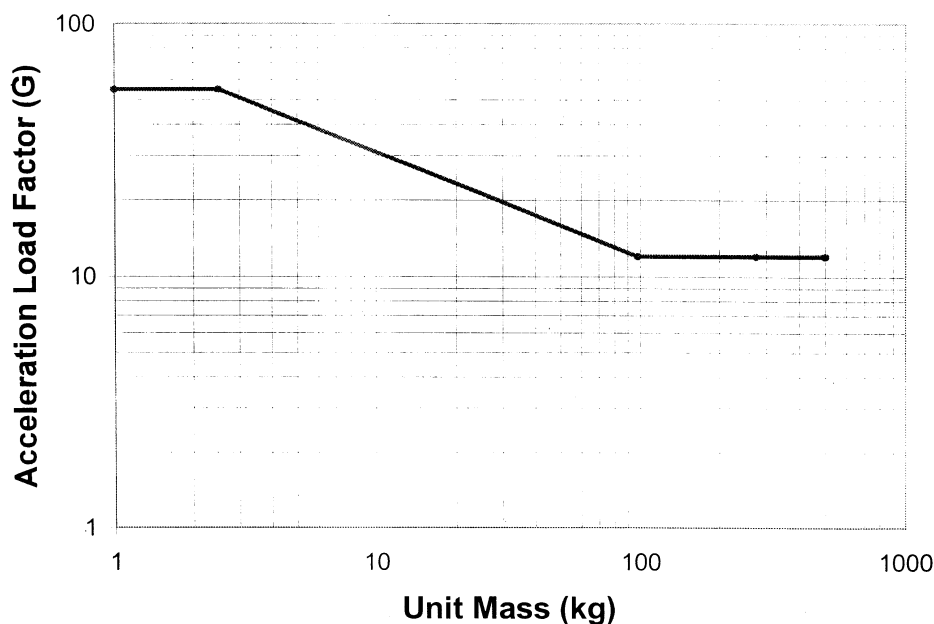| Mass (kg)	Load (G)
≤ 2.5	55
98	12
500	12

(CCR 00081A) (CCR 00196)

ID	Object Number	**417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)**

GIRD589   3.2.6.2.3.0-2   **Mass Acceleration Curve Figure** *(CCR 00196)*

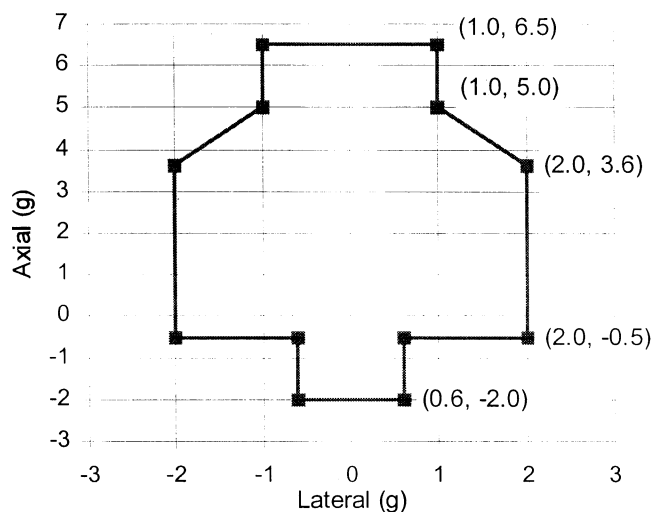**Unit Mass (kg)**

(CCR 00196)

GIRD590   3.2.6.2.3.0-3   The quasi-static acceleration limit loads for the center of mass of the spacecraft will not exceed the limits plotted in Quasi-Static Spacecraft Center of Mass Limit Loads Figure.

Quasi-Static Spacecraft Center of Mass Limit Loads Figure

GIRD591   3.2.6.2.4   **3.2.6.2.4 Flight Random Vibration**

GIRD592   3.2.6.2.4.0-1   Based on the structural vibrations produced by the vibration and acoustic launch environments, the spacecraft contractor will document in the ICD measured or predicted maximum expected flight level random vibration environments for each of the instrument units. Flight levels are equivalent to acceptance levels.

| ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD874	3.2.6.2.4.0-2	The ASD levels **shall** not exceed the limits set in **GIRD588** and **GIRD589** Flight Acceleration.
GIRD593	3.2.6.2.4.0-3	The maximum expected flight random vibration Acceleration Spectral Density (ASD) for each instrument unit with a mass less than 22.7 kg **shall** not exceed the limit levels shown in the Flight Limit Acceleration Spectral Densities (ADS) figure in **GIRD596**.
GIRD594	3.2.6.2.4.0-4	For each instrument unit with a mass greater than 22.7 kg and less than 59 kg, the limit ASD levels **shall** be reduced by a factor of 22.7 kg divided by the mass of the unit in kilograms while maintaining the slope magnitudes at 6 dB per octave.
GIRD595	3.2.6.2.4.0-5	For each instrument unit with a mass greater than 59 kg and less than 182 kg, the limit ASD levels for the 50 to 800 Hz band **shall** be reduced by a factor of 22.7 kg divided by the mass of the unit in kilograms while maintaining the 20 and 2000 Hz levels at 0.005 g^2/Hz.
GIRD596	3.2.6.2.4.0-6	For each instrument unit with a mass greater than 182 kg, the flight ASD levels **shall** not exceed the limit ASD levels for a 182 kg unit. The Flight Limit Acceleration Spectral Densities (ASD) Figure plots the limit acceleration spectral densities for units with a mass of 22.7, 59 and 182 kg.

ID	Object Number

417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)

GIRD596   3.2.6.2.4.0-6

Flight Random Vibration Table

Frequency (Hz)	Units	Component Mass		
	kg	22.7	59	182
20	g^2/Hz	0.013	0.005	0.005
20-50	dB/oct	+6.0	+6.0	+2.3
50-800	g^2/Hz	0.080	0.031	0.010
800-2000	dB/oct	-6.0	-6.0	-2.3
2000	g^2/Hz	0.013	0.005	0.005
Overall	g rms	10.0	6.2	4.0

Flight Limit Acceleration Spectral Densities (ASD) Figure
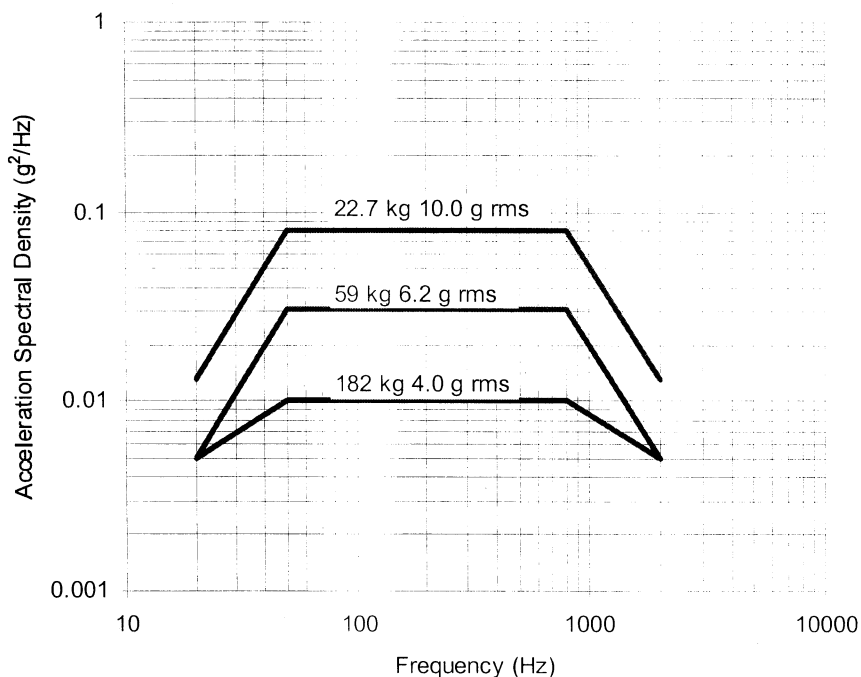
GIRD597   3.2.6.2.5

3.2.6.2.5 Flight Sinusoidal Vibration

GIRD598   3.2.6.2.5.0-1

Based on the structural response of the spacecraft produced by the maximum expected launch vehicle interface sinusoidal acceleration, the spacecraft contractor will document in the ICD the predicted maximum sinusoidal acceleration response at the interfaces for each of the instrument units.
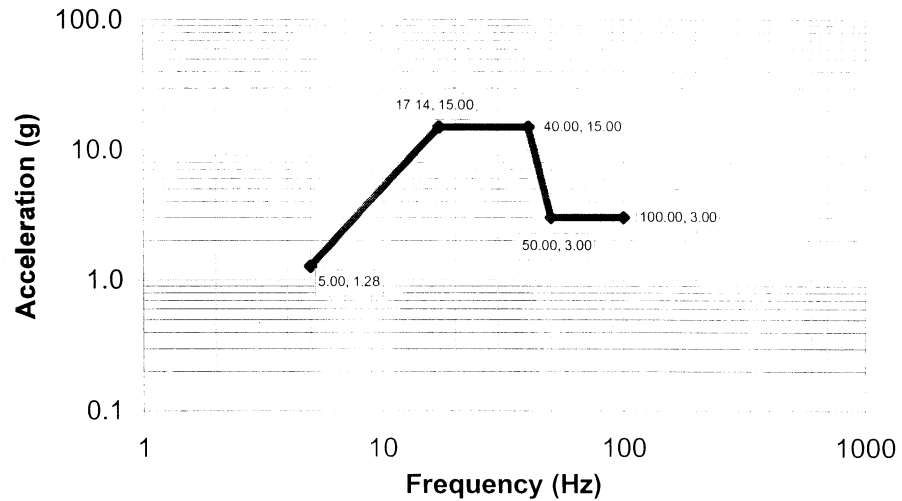
GIRD599   3.2.6.2.5.0-2

The maximum flight sinusoidal acceleration limit loads at the interfaces for each of the instrument units **shall** not exceed the limits in the Flight Limit Instrument Unit Sinusoidal Accelerations Figure and the limits set in GIRD588 and GIRD589 Flight Acceleration.

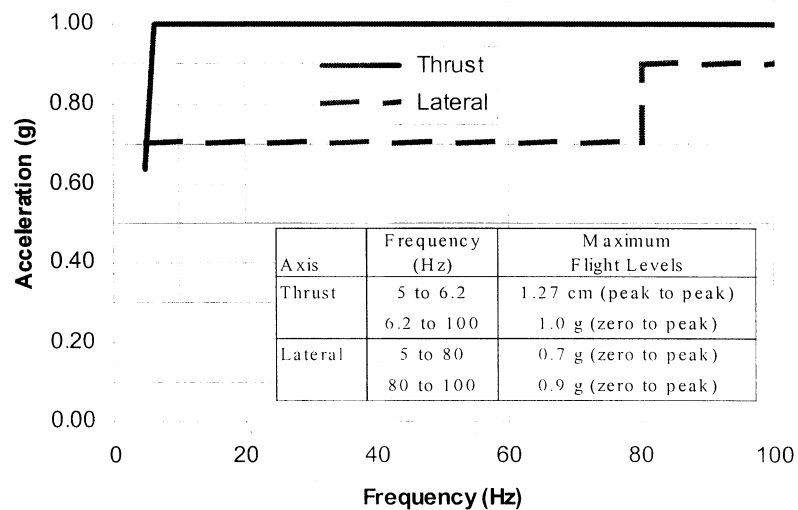| ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD599	3.2.6.2.5.0-2	**Flight Limit Instrument Unit Sinusoidal Accelerations Figure (*CCR 00023*)**

GIRD600	3.2.6.2.5.0-3	The maximum flight sinusoidal acceleration limit loads at the interface between the spacecraft and the launch vehicle **shall** not exceed the limits plotted in Limit Spacecraft to Launch Vehicle Sinusoidal Accelerations Figure.

Limit Spacecraft to Launch Vehicle Sinusoidal Accelerations Figure

Axis	Frequency (Hz)	Maximum Flight Levels
Thrust	5 to 6.2	1.27 cm (peak to peak)
	6.2 to 100	1.0 g (zero to peak)
Lateral	5 to 80	0.7 g (zero to peak)
	80 to 100	0.9 g (zero to peak)

|		
GIRD601	3.2.6.2.6	**3.2.6.2.6 Shock**
GIRD602	3.2.6.2.6.0-1	Based on launch vehicle and spacecraft shock inputs transmitted through spacecraft structure, the spacecraft contractor will document in the ICD the expected shock levels at the interfaces of the instrument units.

ID	Object Number	**417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)**

GIRD885   3.2.6.2.6.0-2   For each instrument unit and for each axis, the flight shock accelerations on the spacecraft side of the instrument to spacecraft interface **shall** produce a peak acceleration response spectra less than the limits set in the Flight Shock Limit Acceleration Response Spectra from the Spacecraft to Instrument Unit Figure when using a quality factor, Q, of 10.

Flight Shock Limit Acceleration Response Spectra from the Spacecraft to Instrument Unit Figure

Frequency (Hz)	Level (Q = 10)
100	22 g
100 to 1000	+9.12 dB/octave
1000 to 10,000	720 g
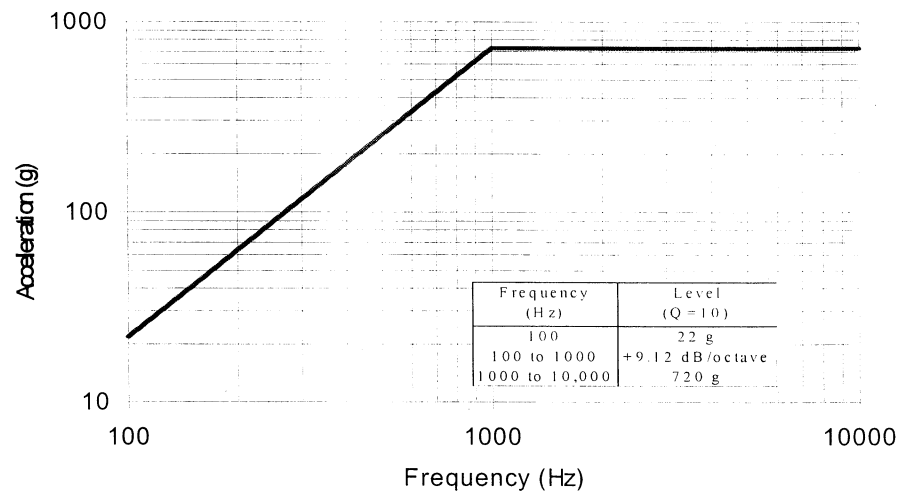
GIRD886   3.2.6.2.6.0-3   The flight shock accelerations on the launch vehicle side of the interface between the spacecraft and the launch vehicle **shall** produce a peak acceleration response spectra less than the limits set in the Flight Shock Limit Acceleration Response Spectra from the Launch Vehicle to Spacecraft Figure in **GIRD919** when using a quality factor, Q, of 10.

GIRD919   3.2.6.2.6.0-4   **Flight Shock Limit Acceleration Response Spectra from the Launch Vehicle to Spacecraft Figure**

Frequency (Hz)	Level (Q=10)
100	150g
100 to 1000	+9.2 dB/octave
1000 to 10,000	5000g
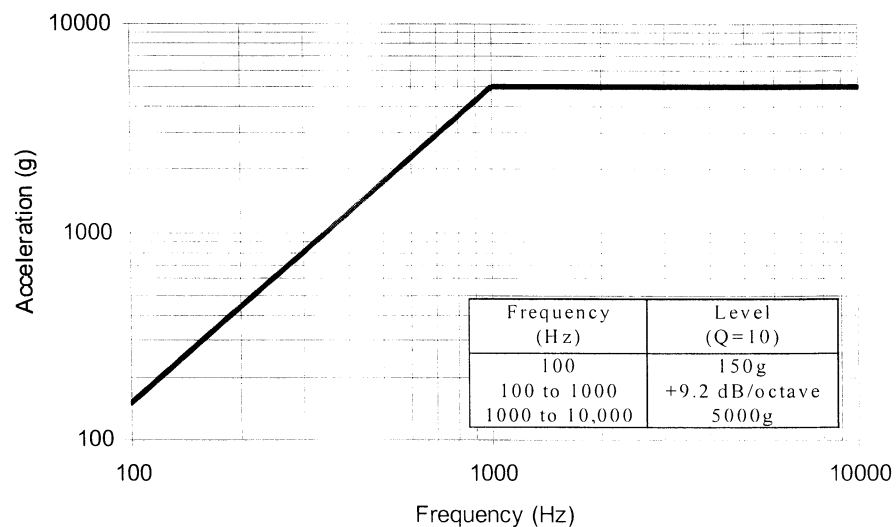
ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD604	3.2.6.2.7	**3.2.6.2.7 Flight Acoustics**
GIRD605	3.2.6.2.7.0-1	The spacecraft contractor will document in the ICD the predicted Maximum Expected Flight Level (MEFL) for the acoustic environment with 95 percent probability and with 50 percent confidence.
GIRD606	3.2.6.2.7.0-2	The MEFL with a 95th percentile and 50 percent confidence **shall** not exceed the one third octave band limit Sound Pressure Levels (SPL) listed by their center frequencies in the Flight Limit Acoustic Sound Pressure Levels Table and plotted in the Flight Limit Acoustic Sound Pressure Levels Figure.

Flight Limit Acoustic Sound Pressure Levels Table

One-third Octave Bands			
Center Frequency (Hz)	SPL* (dB)	Center Frequency (Hz)	SPL* (dB)
31.5	124.5	630	125.0
40	127.0	800	123.0
50	128.5	1000	121.5
63	130.0	1250	120.0
80	130.5	1600	118.0
100	130.5	2000	116.5
125	130.5	2500	115.0
160	130.5	3150	113.5
200	130.5	4000	112.0
250	130.5	5000	110.5
315	130.2	6300	109.0
400	129.5	8000	107.5
500	128.0	10000	106.0
*Reference pressure is 20 µPa		QASPL	141.06

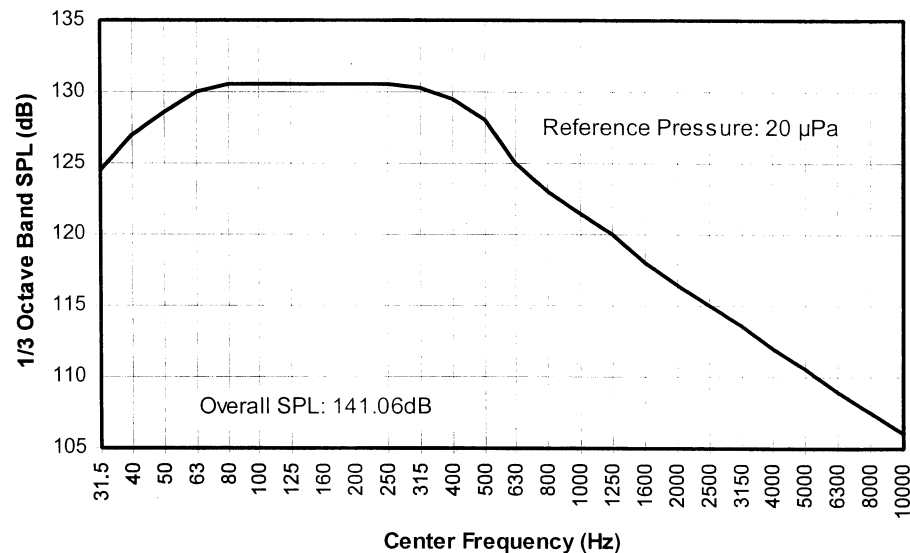*(CCR 00173)*

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD606	3.2.6.2.7.0-2	

Flight Limit Acoustic Sound Pressure Levels Figure

(CCR 00173)

GIRD607	3.2.6.3	**3.2.6.3 On-Orbit Environment**
GIRD608	3.2.6.3.1	**3.2.6.3.1 Acceleration**
GIRD609	3.2.6.3.1.0-1	Instrument flight hardware **shall** be designed to withstand a maximum acceleration of 0.040 (TBR) g on orbit without permanent degradation of performance.
GIRD612	3.2.6.3.2	**3.2.6.3.2 Orbital Heat Flux**
GIRD613	3.2.6.3.2.0-1	The following orbital heat flux magnitudes **shall** be assumed.
GIRD614	3.2.6.3.2.1	**3.2.6.3.2.1 Direct Solar Flux**
GIRD615	3.2.6.3.2.1.0-1	The maximum magnitude of direct solar flux to be used **shall** be 1414 $W/m^2 \pm 5$ W/m^2 uncertainty occurring at earth perihelion.
GIRD616	3.2.6.3.2.1.0-2	The minimum magnitude of direct solar flux to be used **shall** be 1322 $W/m^2 \pm 5$ W/m^2 uncertainty occurring at earth aphelion. Fluxes on specific dates may use a cosine interpolation between the perihelion and aphelion. *(CCR 00021)*
GIRD617	3.2.6.3.2.2	**3.2.6.3.2.2 Non-Cryogenic Systems**
GIRD618	3.2.6.3.2.2.0-1	For non-cryogenic instruments, only solar flux needs to be considered.
GIRD619	3.2.6.3.2.3	**3.2.6.3.2.3 Cryogenic Systems**
GIRD620	3.2.6.3.2.3.0-1	For cryogenic instruments, in addition to solar flux, earth reflected solar flux (albedo flux) and earth radiation **shall** be considered.
GIRD621	3.2.6.3.2.3.0-2	Earth reflected solar flux **shall** be modeled assuming a 0.26 albedo factor (Lambertian earth reflection assumed).

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD622	3.2.6.3.2.3.0-3	Earth IR **shall** be modeled assuming a 326 W/m^2 emitted radiance (at earth's surface), which is equivalent to a 2^O C black body earth temperature.
GIRD623	3.2.6.3.2.4	**3.2.6.3.2.4 Eclipse**
GIRD624	3.2.6.3.2.4.0-1	Solar Eclipse **shall** be considered as part of the environmental variation. The Solar Eclipse season occurs twice yearly, with each eclipse season lasting approximately 45 days. The maximum eclipse duration is 72 minutes.
GIRD625	3.2.6.3.2.5	**3.2.6.3.2.5 Lunar Eclipse**
GIRD626	3.2.6.3.2.5.0-1	Lunar Eclipses **shall** be considered for instrument survivability. Lunar eclipses of 105 minutes maximum duration are rare occurrences.
GIRD627	3.2.6.3.2.5.0-2	Lunar Eclipses **shall** not be considered as a nominal operation design case.
GIRD629	3.3	**3.3 Attitude and Orbit Data**
GIRD946	3.3.0-1	All attitude, rate and orbit data **shall** be included in the spacecraft ancillary data packet.
GIRD630	3.3.1	**3.3.1 Attitude Knowledge**
GIRD631	3.3.1.0-1	The spacecraft **shall** provide a periodic attitude estimate to the instrument.
GIRD632	3.3.1.1	**3.3.1.1 Representation**
GIRD633	3.3.1.1.0-1	The attitude estimate **shall** be a quaternion representation of the attitude of the instrument mounting frame relative to the J2000 inertial reference frame.
GIRD634	3.3.1.2	**3.3.1.2 Accuracy**
GIRD635	3.3.1.2.0-1	The attitude estimate **shall** be accurate to within ±100 microradians, per axis, 3-sigma. This requirement bounds the knowledge error, which is the difference between the estimated attitude and the true attitude.
GIRD636	3.3.1.3	**3.3.1.3 Update Rate**
GIRD637	3.3.1.3.0-1	The spacecraft **shall** update the attitude estimate at a rate no less than 1 Hz.
GIRD638	3.3.1.4	**3.3.1.4 Latency**
GIRD639	3.3.1.4.0-1	The attitude estimate latency **shall** not exceed 100 milliseconds.
GIRD640	3.3.2	**3.3.2 Spacecraft Angular Rate**
GIRD641	3.3.2.0-1	The spacecraft **shall** provide a periodic angular rate estimate to the instrument.
GIRD642	3.3.2.1	**3.3.2.1 Representation**
GIRD643	3.3.2.1.0-1	The spacecraft angular rate data **shall** be the inertial angular rate of the spacecraft, in units of microradians per second, resolved in the instrument mounting frame defined in **GIRD1064**.
GIRD644	3.3.2.2	**3.3.2.2 Accuracy**

ID	Object Number	417-R-GIRD-0009, RM Version, GOES-R Series, General Interface Requirements Document (GIRD)
GIRD645	3.3.2.2.0-1	The accuracy of the spacecraft angular rate estimate is characterized by rate white noise, angle white noise, and the integral of the rate error over a specified time window. The rate error is defined as the difference between the estimated rates and the actual rates of the spacecraft. The integrated rate error includes all residual IRU errors after compensation by the spacecraft and also includes errors due to alignment knowledge error between the IRU input axes and the instrument mounting frame.
GIRD1068	3.3.2.2.0-2	The rate white noise component of the spacecraft angular rate estimate **shall** not exceed a power spectral density (PSD) level of $$\sigma_v = 0.05\,\mu rad\,/\,s^{1/2}$$
GIRD1069	3.3.2.2.0-3	The angle white noise component of the spacecraft angular rate estimate **shall** not exceed a power spectral density (PSD) level of $$\sigma_e = 0.02\,\mu rad\,/\,Hz^{1/2}$$
GIRD646	3.3.2.2.0-4	The integrated rate error of the spacecraft angular rate estimate **shall** not exceed ±0.6 microradians, 3-sigma, per axis, over any 1-second window.
GIRD647	3.3.2.2.0-5	In addition, the integrated rate error of the spacecraft angular rate estimate **shall** not exceed ±2 microradians, 3-sigma, per axis, over any 120-second window.
GIRD648	3.3.2.2.0-6	In addition, the integrated rate error of the spacecraft angular rate estimate **shall** not exceed ±5 microradians, 3-sigma, per axis, over any 300-second window.
GIRD649	3.3.2.3	### 3.3.2.3 Bandwidth
GIRD650	3.3.2.3.0-1	The spacecraft angular rate estimate **shall** have a minus 3dB bandwidth of greater than 25 Hz.
GIRD973	3.3.2.3.0-2	The spacecraft angular rate estimate **shall** have a second order frequency response.
GIRD974	3.3.2.3.0-3	The frequency response amplitude of the spacecraft angular rate estimate **shall** be stable to less than 1% (TBR) from 0.1 to 25 Hz.
GIRD975	3.3.2.3.0-4	The frequency response phase of the spacecraft angular rate estimate **shall** be stable to less than 1 degree (TBR) from 0.1 to 25 Hz.
GIRD976	3.3.2.3.0-5	The spacecraft contractor will document in the instrument ICD the gyro rate frequency response function from 0 Hz to at least ten times the -3dB gyro bandwidth .
GIRD651	3.3.2.4	### 3.3.2.4 Update Rate
GIRD652	3.3.2.4.0-1	The spacecraft **shall** update the angular rate estimate at a rate no less than 100 Hz.
GIRD654	3.3.2.4.0-2	Spacecraft angular rate sampling **shall** be uniform to within ±20 microseconds.
GIRD653	3.3.2.5	### 3.3.2.5 Phase Delay
GIRD655	3.3.2.5.0-1	For a given instrument mounting frame attitude error rate, the total spacecraft gyro signal phase delay **shall** not exceed the corresponding limit from the Total Spacecraft Gyro Signal Phase Delay and Rate Error Trade Space Figure (GIRD155 [3.2.1.7.1.2.0-1]) for sinusoidal excitations at 10 Hz or below. For sinusoidal system excitation, $\sin(\omega t)$, the phase delay, t_d, in the

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GIRD655	3.3.2.5.0-1	system output is defined as $\sin(\omega(t - t_d))$. Phase delay includes all delays from the time a physical event occurs through the time the data recording the event is received at the instrument. It includes sensor dynamics, sensor delay, spacecraft processor delays and SpaceWire delays.
GIRD656	3.3.2.5.0-2	Spacecraft angular rate latency **shall** be stable to within ±20 microseconds.
GIRD657	3.3.3	### 3.3.3 Spacecraft Orbit
GIRD658	3.3.3.0-1	The spacecraft **shall** provide a periodic spacecraft orbit estimate to the instrument via the ancillary data packet.
GIRD659	3.3.3.1	### 3.3.3.1 Representation
GIRD660	3.3.3.1.0-1	The spacecraft orbit estimate **shall** include Cartesian position and velocity vectors in the J2000 (TBR) frame, and a time tag corresponding to the orbit vectors. *(CCR 00020A)*
GIRD661	3.3.3.2	### 3.3.3.2 Accuracy
GIRD662	3.3.3.2.0-1	The spacecraft position estimate **shall** be accurate to 100 meters 3-sigma, in-track (ORF x-axis), cross-track (ORF y-axis) and radial (ORF z-axis) directions. *(CCR 00020A) (CCR00084)*
GIRD663	3.3.3.2.0-2	The spacecraft velocity estimate **shall** be accurate to within ±10 cm/sec , 3-sigma per axis. *(CCR 00040A)*
GIRD664	3.3.3.3	### 3.3.3.3 Update Rate
GIRD665	3.3.3.3.0-1	The spacecraft **shall** update the orbit estimate at a rate no less than 1 Hz. *(CCR 00096A)*
GIRD666	3.3.3.4	### 3.3.3.4 Latency
GIRD667	3.3.3.4.0-1	The spacecraft orbit estimate latency **shall** not exceed 1 second.
GIRD668	3.4	### 3.4 Instrument GSE to Spacecraft I&T GSE Interface
GIRD921	3.4.0-1	Instrument GSE **shall** receive instrument telemetry via the spacecraft electrical GSE.
GIRD922	3.4.0-2	Commanding of the instrument **shall** be from the spacecraft electrical GSE.
GIRD783	3.5	### 3.5 Contamination Control
GIRD784	3.5.1	### 3.5.1 Instrument and Spacecraft Ground Processing
GIRD785	3.5.1.1	### 3.5.1.1 Facility Requirements
GIRD793	3.5.1.1.0-1	During observatory level I&T and launch processing facility operations airborne particle fallout **shall** not exceed 0.022 percent area coverage (%AC) per month in an ISO 14644-1 Class 7 facility. *(CCR 00115)*
GIRD794	3.5.1.1.0-2	During observatory level I&T and launch processing facility operations airborne particle fallout **shall** not exceed 0.22 %AC per month in an ISO 14644-1 Class 8 facility. *(CCR 00115)*
GIRD795	3.5.1.1.0-3	During observatory level I&T and launch processing facility operations airborne molecular fallout **shall** not exceed 0.30 micrograms per square centimeter (μg/cm^2) per month in a cleanroom. *(CCR 00115)*

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GIRD788	3.5.1.1.0-4	During observatory level I&T and launch processing facility operations flight hardware **shall** be processed in an ISO 14644-1 Class 7 (TBR) cleanroom or better when contamination sensitive surfaces are exposed. *(CCR 00115)*
GIRD787	3.5.1.1.0-5	During observatory level I&T and launch processing facility operations flight hardware **shall** be processed in an ISO 14644-1 Class 8 (TBR) cleanroom or better when contamination sensitive surfaces are covered. Optical solar reflectors (OSRs) and solar panels are exceptions and may be exposed in an ISO 14644-1 Class 8 cleanroom. *(CCR 00115)*
GIRD789	3.5.1.1.0-6	The spacecraft contractor will be responsible for testing and monitoring ISO 14644-1 Class conformance during observatory I&T and launch processing facility operations. Conformance will be determined by monitoring both airborne particle counts larger than 0.5 μm and airborne particle counts larger than 5.0 μm per the measurement and test methods described in ISO 14644-3 (TBR). *(CCR 00115)*
GIRD792	3.5.1.1.0-7	During observatory level I&T and launch processing facility operations flight hardware **shall** be maintained in a relative humidity environment between 30 and 60%. *(CCR 00115)*
GIRD798	3.5.1.2	### 3.5.1.2 Ground Support Equipment Requirements
GIRD801	3.5.1.2.0-1	GSE hardware used in vacuum testing **shall** outgas less than 1×10^{-7} g/cm²-hr (TBR) at 10°C above the maximum survival temperature of the flight hardware that they are tested with when measured with a QCM held at -65°C (208 K). *(CCR 00115)*
GIRD1158	3.5.1.2.0-2	Any GSE which must accompany the instrument or spacecraft into a cleanroom area **shall** be visibly clean per SN-C-0005 (JSC) (TBR). *(CCR 00115)*
GIRD1159	3.5.1.2.0-3	Any GSE which must contact flight hardware in a cleanroom area **shall** meet the same cleanliness requirement as the cleanest flight hardware it will contact once in the cleanroom. *(CCR 00115)*
GIRD802	3.5.1.3	### 3.5.1.3 Purge Requirements
GIRD803	3.5.1.3.0-1	Prior to instrument integration on the spacecraft and during any subsequent instrument deintegration periods the instrument contractor will be responsible for providing a gas purge to the instrument optical cavity during all storage, test, and transport operations if required by the instrument. *(CCR 00115)*
GIRD1160	3.5.1.3.0-2	Following instrument integration on the spacecraft the spacecraft contractor will be responsible for providing a gas purge to the instrument optical cavities during all storage, test, and transport operations if required by the instrument. *(CCR 00115)*
GIRD1161	3.5.1.3.0-3	During observatory level I&T and launch processing facility operations spacecraft provided purge gas properties **shall** be coordinated with the instrument providers and detailed in the ICD. *(CCR 00115)*
GIRD812	3.5.1.4	### 3.5.1.4 Ground Storage/Transportation Requirements
GIRD813	3.5.1.4.0-1	During extended inactivity, storage, and transportation periods, the instrument **shall** be bagged in an instrument provided ESD protective material. *(CCR 00115)*
GIRD1162	3.5.1.4.0-2	During storage and transportation periods the observatory **shall** be bagged in a spacecraft provided ESD protective material. Spacecraft provided observatory bagging will be used in addition to the instrument provided instrument bagging. *(CCR 00115)*
GIRD814	3.5.1.4.0-3	Storage and transport accommodations **shall** not transfer more than 0.02 %AC of particles during storage or transport periods. *(CCR 00115)*

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GIRD815	3.5.1.4.0-4	Storage and transport accommodations **shall** not transfer more 0.30 μg/cm² of molecular contamination during storage or transport periods. *(CCR 00115)*
GIRD1163	3.5.1.4.0-5	During storage and transportation periods the observatory **shall** be maintained in an ISO 14644-1 Class 8 controlled environment. *(CCR 00115)*
GIRD1164	3.5.1.4.0-6	During storage and transportation periods the observatory **shall be** maintained in a relative humidity environment between 30 and 60%. *(CCR 00115)*
GIRD820	3.5.2	### 3.5.2 Mission Considerations
GIRD821	3.5.2.1	### 3.5.2.1 Design
GIRD822	3.5.2.1.0-1	Multi Layer Insulation (MLI) venting and spacecraft vents **shall** be directed away from instrument optical ports, instrument thermal control surfaces, and spacecraft thermal control surfaces.
GIRD823	3.5.2.1.0-2	All MLI joints **shall** be sealed shut prior launch, so that only the planned vent paths allow outgassed molecular species to escape. This requirement will not supersede any requirement for thermal isolation. It is meant to reduce outgassing in an unplanned direction.
GIRD1165	3.5.2.1.0-3	The number, location, size, and orientation of all instrument and spacecraft vents **shall** be detailed in the ICD. *(CCR 00115)*
GIRD830	3.5.2.2	### 3.5.2.2 Mission Performance
GIRD831	3.5.2.2.1	### 3.5.2.2.1 Particulate Contamination
GIRD832	3.5.2.2.1.0-1	The combined spacecraft and instrument particulate contamination contribution **shall** produce no more than a 0.3% (TBR) area coverage of particles to any exposed sensitive surface at end of life. Spacecraft and instrument specific particulate contamination allocations will be detailed in the ICD. *(CCR 00115)*
GIRD833	3.5.2.2.2	### 3.5.2.2.2 Molecular Contamination
GIRD834	3.5.2.2.2.0-1	The combined spacecraft and instrument external molecular contamination contribution **shall** produce no more than 6 μg/cm² (TBR) of nonvolatile residue to instrument thermal control surface apertures, and the instrument optical aperture at end of life. Spacecraft and instrument specific molecular contamination allocations will be detailed in the ICD. Note - the following guidelines will be used for instrument analyses: The instrument contractor will use a density of 1.0 g/cm³ for all molecular contaminants. The instrument contractor will use a transformation value of 0.01 solar absorptance units per 100 Angstroms of NVR on fused quartz optical solar reflectors (OSRs). *(CCR 00115)*
GIRD837	3.5.2.2.2.0-2	The BOL outgassing rates from the molecular contamination analysis for instruments, spacecraft main body, MLI, and the solar array **shall** be verified using a quartz crystal microbalance. BOL outgassing is the final outgassing rate determined during system-level thermal vacuum testing at the mission high temperature, plus 10°C.
GIRD1139	3.6	### 3.6 Acronyms
GIRD1140	3.6.0-1	%AC percent area coverage A Ampere(s) ASD Acceleration Spectral Density BOL beginning of life

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GIRD1140   3.6.0-1

BRF	body reference frame
bps	bits per seconds
C	Celsius (Degrees)
cm	centimeter
db	decibel
dc	Direct Current
ECSS	European Cooperation for Space Standardization
EED	Electro-Explosive Device
EEE	Electrical, Electronic and Electromechanical
ESD	electro static discharge
FOR	field of regard
FOV	field-of-view
g	Earth's gravitational acceleration
GIRD	General Interface Requirements Document
GOES	Geosynchronous Operational Environmental Satellite
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
Hz	hertz
ICD	Interface Control Document
IDD	Instrument Description Document
IRU	inertial reference unit
ISO	International Office for Standardization
K	kelvin
kg	kilogram
Km	kilometer
kPa	Kilo Pascals
LOS	line-of-sight
LSB	Least Significant Bit
m	meter
ma	milli-ampere(s)
Mbps	Mega bits per seconds
MHz	Mega hertz
mm	millimeter
MAT	Mission Allowable Temperatures
MEFL	Maximum Expected Flight Level
m-g	milli-g (Earth's gravitational acceleration)
MLI	Multi-layer insulation
Ms	milli-seconds
NASA	National Aeronautics and Space Administration
N-m	Newton-meter
N-m-sec	Newton-meter-second
nPa	Nano Pascals
NVR	Non-Volatile Residue
ORF	Orbit reference frame
OSR	Optical solar reflectors
PPB	Parts Per Billion
PPM	Parts Per Million
PPS	Pulse Per Second
PSD	power spectral density
QCM	Quartz Crystal Microbalance
RIU	Remote Interface Unit
SCF	SPP Coordinate Frame
SI	International System of Units
SINDA	System Integrated Numerical Differential Analyzer
SIS	Solar Imaging Suite
SPP	Sun-Pointing Platform
SRS	Shock Response Spectra
TBD	to be determined

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GIRD1140	3.6.0-1	TBR	to be refined/reviewed
		THC	Total Hydrocarbons
		UIID	Unique Instrument Interface Document
		UTC	Universal Time Code
		μsec	mico-seconds
		V	Volts
		Vdc	Volts-Direct Current
		W	Watts

417-R-GIRD-0009 DCR

CCR #: 00005 Rev
CCB Status: **Approved**
CCB Date: 12/7/2004

Doc Change Date:
  12/7/2004

Title: GIRD Orbit and Body Reference Frames (ORF/BRF)
GOES S/C: R Effectivity: S/C and Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
            5HY06C, 5HY07C
CCR Summary: Clarifies ORF and BRF definitions and makes BRF a
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.1.4 - 1, 3.1.4 - 2
DOORS Version: GIRD 2.0
DOORS ID #: GIRD52, GIRD53

CCR #: 00009 Rev
CCB Status: **Approved**
CCB Date: 12/7/2004

Doc Change Date:
  12/7/2004

Title: Simplification of Survival Heater Power Interface
GOES S/C: R Effectivity: S/C and Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
            5HY06C, 5HY07C
CCR Summary: Simplifies survival heater power requirements.
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD: 3.2.3.2.3, 3.2.3.2.4, 3.2.3.2.6, 3.2.3.2.7
DOORS Version: GIRD 2.0
DOORS ID #: GIRD360, 361, 362, 363, 365, 366, 367, 368, 370, 371, 373,
            374, 376, 377, 378, 380, 381, 382, 383, 390, 392, 930, 397

CCR #: 00021 Rev
CCB Status: **Approved**
CCB Date: 12/7/2004

Doc Change Date:
  12/7/2004

Title: GIRD Typos Cleanup
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
            5HY06C, 5HY07C
CCR Summary: Corrects typos in the GIRD
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.2.2.6.1, 3.2.6.3.2.1
DOORS Version: GIRD 2.0
DOORS ID #: GIRD221 (3.2.2.6.1-1), GIRD616 (3.2.6.3.2.1-2)

CCR #: 00023 Rev
CCB Status: **Approved**
CCB Date: 12/7/2004

Doc Change Date:
  12/7/2004

Title: Flight Sinusoidal Vibration Limit Adjustment
GOES S/C: R Effectivity: Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
            5HY06C, 5HY07C
CCR Summary: Adjusts the Flight Sinusoidal Vibration Limit.
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.2.6.2.5
DOORS Version: GIRD 2.0
DOORS ID #: GIRD599 (3.2.6.2.5-2)

CCR #: 00008 Rev A
CCB Status: **Approved**
CCB Date: 2/18/2005

Doc Change Date:
  3/15/2005

Title: GIRD Grounding Section Clean-up
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
            5HY06C, 5HY07C
CCR Summary: Updates SC and instrument grounding requirements.
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD: 3.2.4.1, 3.2.4.2, 3.2.4.3
DOORS Version: GIRD 2.0
DOORS ID #: GIRD1058 (3.2.4.1-4), 404 (3.2.4.1-5), 972 (3.2.4.1-6), 411
            (3.2.4.2-1), 412 (3.2.4.2-2), 948 (3.2.4.2-3), 417 (3.2.4.3-3)

CCR #: 00020 Rev A
CCB Status: **Approved**
CCB Date: 2/18/2005

Doc Change Date:
  3/15/2005

Title: GIRD Orbit Knowledge Clarifications
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
            5HY06C, 5HY07C
CCR Summary: Clarifies Orbit Knowledge.
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.3.3.1, 3.3.3.2
DOORS Version: GIRD 2.0
DOORS ID #: GIRD660 (3.3.3.1-1), GIRD662 (3.3.3.2-1)

CCR #: 00041 Rev A

**Title: Delete GIRD968 - Duplicates ABIMAR795 Electromagnetic
        Compatibility Requirements**

CCB Status: **Approved**
CCB Date: 2/18/2005

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3/15/2005

GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
5HY06C, 5HY07C
CCR Summary: Deletes duplicate electromagnetic compatibility requirements.
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.2.4.5.2
DOORS Version: GIRD 2.0
DOORS ID #: GIRD968 (3.2.4.5.2-1)

CCR #: 00077 Rev
CCB Status: **Approved**
CCB Date: 2/18/2005

Doc Change Date:
3/15/2005

Title: SIS Pointing Requirements Update
GOES S/C: R Effectivity: Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
5HY06C, 5HY07C
CCR Summary: Update of SIS pointing requirements
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.2.1.5.2, 3.2.1.8
DOORS Version: GIRD 2.0
DOORS ID #: GIRD1093 (3.2.1.5.2.1-1) 1094 (-2), 1095 (-3), 1097 (-5), 1099
(3.2.1.5.2.2-1), 1100 (-2), 1101 (-3), 1102 (-4), 1104 (3.2.1.5.2.3-
1), 1112 (3.2.1.8-1), 1113 (3.2.1.8-2), 1116 (3.2.1.8.1.1-1), 1138
(-2), 1117 (-3), 1118 (-4), (TBD) (-5), 1120 (3.2.1.8.1.2-1)

CCR #: 00040 Rev A
CCB Status: **Approved**
CCB Date: 4/1/2005

Doc Change Date:

4/1/2005

Title: Relaxation of Orbit Velocity Accuracy
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
5HY06C, 5HY07C
CCR Summary: Relaxation of Orbit Velocity accuracy requirement and
correction of DOORS object ID number.
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.3.3.2
DOORS Version: GIRD 2.0
DOORS ID #: GIRD663 (3.3.3.2-2)

CCR #: 00084 Rev
CCB Status: **Approved**
CCB Date: 4/1/2005

Doc Change Date:

4/1/2005

Title: GIRD Orbit Position Accuracy Requirement
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
5HY06C, 5HY07C
CCR Summary: Changes orbit position accuracy so it does not drive system
performance.
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.3.3.2
DOORS Version: GIRD 2.0
DOORS ID #: GIRD662 (3.3.3.2-1)

CCR #: 00095 Rev
CCB Status: **Approved**
CCB Date: 6/8/2005

Doc Change Date:
6/13/2005

Title: Move SIS Pointing from GIRD to UIID
GOES S/C: R Effectivity: Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
5HY06C, 5HY07C
CCR Summary:
Doc #: 417-R-GIRD-0009, 417-R-SISUIID-0034
Doc Section #: GIRD: 3.2.1.5.2 and 3.2.1.8; SIS UIID: 5.3 and 5.4
DOORS Version: GIRD 2.0,
DOORS ID #: GIRD1091 - 1108, GIRD166, GIRD1112 - 1116, GIRD1138,
GIRD1117, 1118, GIRD1142-1145, GIRD1119 - 1133,

CCR #: 00098 Rev
CCB Status: **Approved**
CCB Date: 7/8/2005

Doc Change Date:
7/8/2005

Title: Requirements terminology standardization
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
5HY06C, 5HY07C
CCR Summary: Revises the document's requirements terminology.
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 1.2
DOORS Version: GIRD 2.0
DOORS ID #: GIRD4, GIRD1154 (1.2-1), GIRD1146 (1.2-2), GIRD1147 (1.2-3),
GIRD1148 (1.2-4), GIRD1149 (1.2-5), GIRD1150 (1.2-6),

CCR #:   00096   Rev A
CCB Status: **Approved**
CCB Date: 7/25/2005

Doc Change Date:
   8/1/2005

Title: GIRD Object Text Language Clean-Up
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 -   4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
         5HY06C, 5HY07C
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #:   GIRD 3.2.1.4.2, 3.2.5.9, 3.2.6.1, 3.2.6.2, 3.3.3.3
DOORS Version: GIRD 2.0
DOORS ID #: GIRD104 (3.2.1.4.2-1), -2, -3, -4, -5, -6, -7, -8, -9(add), GIRD463
         (3.2.5.9-1), GIRD935 (3.2.6.1-1), GIRD577 (3.2.6.2-1), GIRD665
         (3.3.3.3-1)

CCR #:   00109   Rev
CCB Status: **Approved**
CCB Date: 8/1/2005

Doc Change Date:
   8/1/2005

Title: GIRD Reliable Delivery Protocol
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 -   4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
         5HY06C, 5HY07C
CCR Summary: Updates GIRD with 417-R-RPT-0050 reference
Doc #: 417-R-GIRD-0009
Doc Section #:   GIRD 2.1, 3.2.5.2.1
DOORS Version: GIRD 2.0
DOORS ID #: GIRD11 (2.1-1), GIRD933 (3.2.5.2.1-1)

CCR #:   00081   Rev A
CCB Status: **Approved**
CCB Date: 6/8/2005
Doc Change Date:
   8/12/2005

Title: Mass Acceleration Curve Limit for Flight Accelerations
GOES S/C: R Effectivity: Instruments
Contract # NNG0 -   NNG04HZ07C
CCR Summary: Revision of flight acceleration requirements.
Doc #: 417-R-GIRD-0009
Doc Section #:   GIRD 3.2.6.2.3
DOORS Version: GIRD 2.0
DOORS ID #: GIRD589 (3.2.6.2.3-2)

CCR #:   00108   Rev
CCB Status: **Approved**
CCB Date: 8/12/2005

Doc Change Date:
   8/12/2005

Title: Redundant Power Cable Harnesses
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 -   4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
         5HY06C, 5HY07C
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #:   GIRD 3.2.3, 3.2.4
DOORS Version: GIRD 2.0
DOORS ID #: GIRD(TBD) (3.2.3.1.1.1-5), GIRD(TBD) (3.2.4.5.3-3)

CCR #:   00115   Rev
CCB Status: **Approved**
CCB Date: 2/23/2006

Doc Change Date:
   2/23/2006

Title: GIRD Contamination Section Update
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 -   4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
         6HX11C, 6HX12C, 6HX13C, SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #:   GIRD 2.1, 3.5
DOORS Version: GIRD 2.0
DOORS ID #: GIRD11 (2.1-1), GIRD793 (3.5.1.1.0-1), 794-2, 795-3, 796-4,
         788-5(now 4), 787-6(5), 789-7(6), 792-8(7), 801 (3.5.1.2.0-1),
         799-2, 800-3, tbd-2,-3, GIRD803 (3.5.1.3.0-1), tbd-2, 804-2, 805-
         3, 806-4, 809-5, 810-6, tbd (3.5.1.3.0-3), tbd (3.5.1.4.0-2), 814-
         2(3), 815-3(4), 816-4, tbd -5, -6, 817 (3.5.1.5) 818-1, 819-2, 824
         (3.5.2.1.0-3), 825-4, 826-5, 827-6, 828-7, 829-8, tbd(3.5.2.1.0-
         3), 832 (3.5.7.2.1.0-1), 834 (3.5.2.2.2.0-1), 835-2, 836-3, 837-4 (2)

CCR #:   00173   Rev
CCB Status: **Approved**
CCB Date: 4/13/2006

Doc Change Date:

Title: Acoustic Levels Specification
GOES S/C: R Effectivity: Instruments
Contract # NNG0 -   4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
         6HX11C, 6HX12C, 6HX13C, SEISS #tbd
CCR Summary:

Doc #: 417-R-GIRD-0009
Doc Section #: 3.2.6.2.7
DOORS Version: GIRD 2.3
DOORS ID #: GIRD606 (3.2.6.2.7.0-2)

CCR #: 00158 Rev
CCB Status: **Approved**
CCB Date: 5/4/2006

Doc Change Date:
5/4/2006

Title: GIRD CCSDS Reference Document and Source Packet Update
GOES S/C: R Effectivity: SC & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C, GLM
RFP. SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 2.1, 3.2.5.4
DOORS Version: GIRD 2.3
DOORS ID #: GIRD11 (2.1.0-1), GIRD429 (3.2.5.4.0-1)

CCR #: 00165 Rev
CCB Status: **Approved**
CCB Date: 3/23/2006

Doc Change Date:
6/2/2006

Title: GIRD Discrete Control Signals Update
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C, 6HX11C,
6HX12C, 6HX13C. SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 3.2.5.9.4, 3.2.5.9.7
DOORS Version: GIRD 2.3
DOORS ID #: GIRD474 (3.2.5.9.4.0-1), GIRD984 (3.2.5.9.7.0-1), GIRD (TBD)

CCR #: 00196 Rev
CCB Status: **Approved**
CCB Date: 6/2/2006

Doc Change Date:
6/2/2006

Title: GIRD Mass Acceleration Curve Update
GOES S/C: R Effectivity: Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
6HX11C, 6HX12C, 6HX13C, SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 3.2.6.2.3
DOORS Version: GIRD 2.3
DOORS ID #: GIRD589 (3.2.6.2.3.0-2)

CCR #: 00213 Rev
CCB Status: **Approved**
CCB Date: 6/2/2006

Doc Change Date:
7/7/2006

Title: Change GIRD GRDDP Applicable Document Version
GOES S/C: R Effectivity: SC & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
6HX11C, 6HX12C, 6HX13C, SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 2.1
DOORS Version: GIRD 2.4
DOORS ID #: GIRD11 (2.1.0-1)

CCR #: 00163 Rev

CCB Status: **Approved**
CCB Date: 5/4/2006

Doc Change Date:
7/8/2006

**Title: Change GIRD Mechanical Disturbance Requirements to Eliminate
Spacecraft Model**
GOES S/C: R Effectivity: Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C, GLM
RFP. SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: GIRD 3.2.1.7
DOORS Version: GIRD 2.3
DOORS ID #: GIRD 157, 1110

CCR #: 00229 Rev
CCB Status: **Approved**
CCB Date: 8/1/2006

Doc Change Date:
8/1/2006

Title: Data Transfer Clock Rate Change
GOES S/C: R Effectivity: SC & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
6HX11C, 6HX12C, 6HX13C, SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 3.2.5.5
DOORS Version: GIRD 2.5
DOORS ID #: GIRD441 (3.2.5.5.0-1)

CCR #: 00250 Rev
CCB Status: Approved
CCB Date: 8/1/2006

Doc Change Date:
8/1/2006

Title: GIRD SIS Thermal
GOES S/C: R Effectivity: SIS Instrument
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
6HX11C, 6HX12C, 6HX13C, SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 3.2.2.1
DOORS Version: GIRD 2.6
DOORS ID #: GIRD172 (3.2.2.1.0-1)

CCR #: 00236 Rev
CCB Status: Approved
CCB Date: 10/17/2006

Doc Change Date:
10/17/2006

Title: GIRD Spacecraft Attitude Error Rate and Gyro Phase Delay
GOES S/C: R Effectivity: SC & Instruments
Contract # NNG0 - Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C, 6HX11C,
6HX12C, 6HX13C, SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 3.2.1.7.1.2, 3.3.2.5
DOORS Version: GIRD 2.5
DOORS ID #: GIRD155 (3.2.1.7.1.2.0-1), GIRD655 (3.3.2.5.0-1)

CCR #: 00274 Rev
CCB Status: Approved
CCB Date: 8/31/2006

Doc Change Date:
10/18/2006

Title: Baseline Release or 417-R-RPT-0027 and GIRD Reference Update
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C,
6HX11C, 6HX12C, 6HX13C, SEISS #tbd
CCR Summary:
Doc #: 417-R-RPT-0027, 417-R-GIRD-0009
Doc Section #: 2, RPT All
DOORS Version: GIRD 2.9, RPT N/A
DOORS ID #: GIRD11 (2.1.0-1), RPT N/A

CCR #: 00309 Rev
CCB Status: Approved
CCB Date: 10/10/2006

Doc Change Date:
11/27/2006

Title: Delete GIRD Nadir Temperature Controlled Platform
GOES S/C: R Effectivity: Instruments
Contract # NNG0 - 4HZ07C, 6HX01C, Info 4HZ48C, 4HZ49C, 4HZ50C,
4HZ65C, 6HX11C, 6HX12C, 6HX13C, SUVI/EXIS TBD
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 3.2.2.3
DOORS Version: GIRD 2.10
DOORS ID #: GIRD202 (3.2.2.3.0-2)

CCR #: 00332 Rev
CCB Status: Approved
CCB Date: 11/27/2006

Doc Change Date:
11/27/2006

Title: Alignment and Disturbance Related Requirement Clarification for
GOES S/C: R Effectivity: Instruments
Contract # NNG0 - 4HZ07C, 6HX01C, Info 4HZ48C, 4HZ49C, 4HZ50C,
4HZ65C, 6HX11C, 6HX12C, 6HX13C, SUVI/EXIS TBD
CCR Summary:
Doc #: 417-R-GIRD-0009, 417-R-SEISSUIID-0031
Doc Section #: GIRD 3.2.1.5.1, 3.2.1.7, SEISSUIID 5.1
DOORS Version: GIRD 2.10,
DOORS ID #: GIRD128 (3.2.1.5.1), 149 (3.2.1.7), SEISSUIID72 (5.1), 69
(5.1.0-1), 75 (5.1.0-2, chg to 3.3.5.0-2), tbd (3.3.5.0-3), 76
(5.1.0-3, chg to 3.3.5.0-4), 73 (5.2, chg to 5.1), 74 (5.2.0-1, chg to 5.1.0-1)

CCR #: 00161 Rev **B**
CCB Status: Approved
CCB Date: 10/23/2006

Doc Change Date:
2/22/2007

Title: GIRD Instrument Electrical Power Section Update
GOES S/C: R Effectivity: S/C & Instruments
Contract # NNG0 - 4HZ07C, Info 4HZ48C, 4HZ49C, 4HZ50C, 4HZ65C, GLM
RFP. SEISS #tbd
CCR Summary:
Doc #: 417-R-GIRD-0009
Doc Section #: 3.2.3
DOORS Version: GIRD 2.7
DOORS ID #: ALL

CCR #: 00372 Rev
CCB Status: Approved
CCB Date: 2/27/2007

Title: Update GRDDP Reference in GIRD Applicable Documents List
GOES S/C: R Effectivity: Instruments
Contract # NNG0 - 4HZ07C, 6HX01C, Info 4HZ48C, 4HZ49C, 4HZ50C,
6HX11C, 6HX12C, 6HX13C, SUVI/EXIS TBD